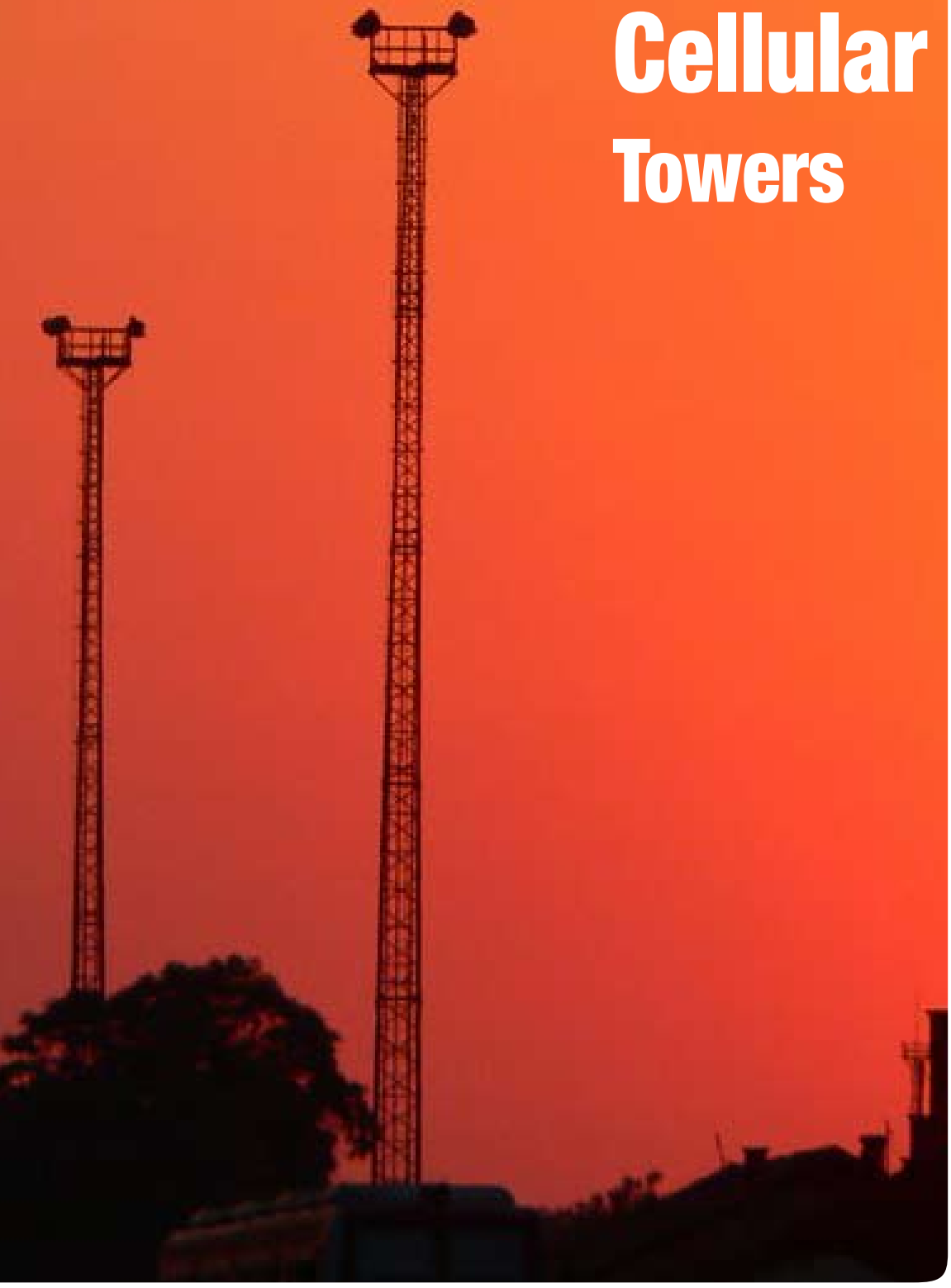
Cellular Phone Towers



FactPack – P129

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Cellular Phone Towers

Center for Health, Environment, & Justice
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June 2015

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Mentoring a Movement

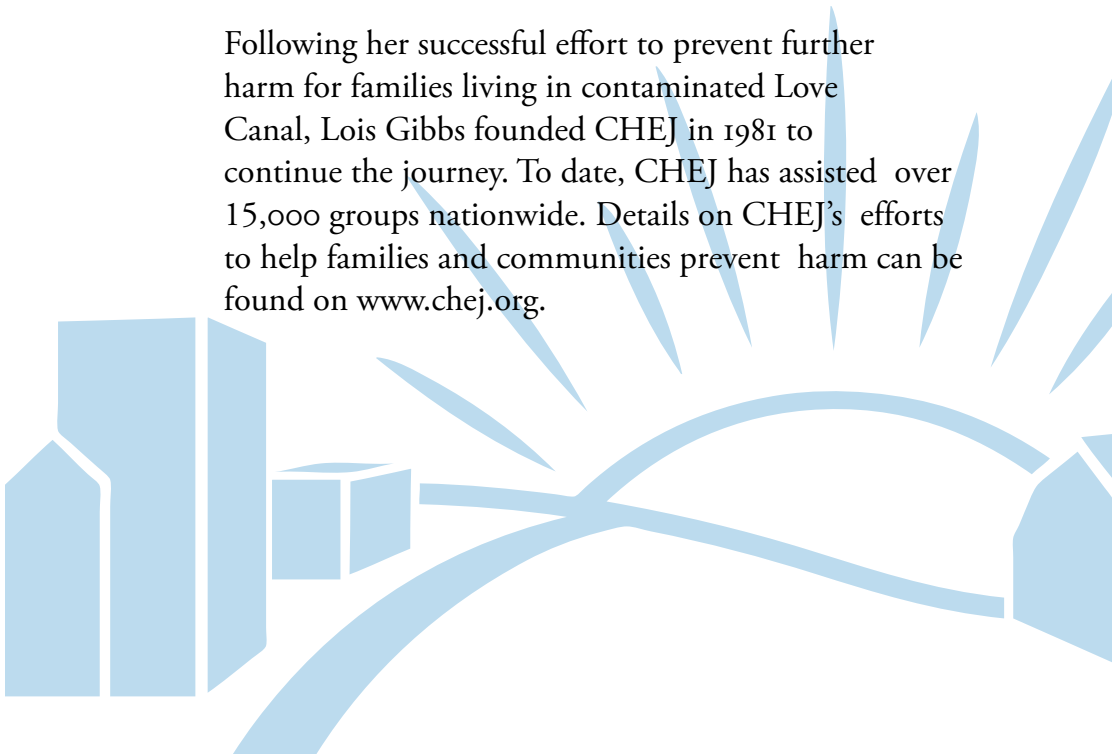
Empowering People

Preventing Harm

About the Center for Health, Environment & Justice

CHEJ mentors a movement building healthier communities by empowering people to prevent harm caused by chemical and toxic threats. We accomplish our work through programs focusing on different types of environmental health threats. CHEJ also works with communities to empower groups by providing the tools, direction, and encouragement they need to advocate for human health, to prevent harm and to work towards environmental integrity.

Following her successful effort to prevent further harm for families living in contaminated Love Canal, Lois Gibbs founded CHEJ in 1981 to continue the journey. To date, CHEJ has assisted over 15,000 groups nationwide. Details on CHEJ's efforts to help families and communities prevent harm can be found on www.chej.org.



Introduction

The Center for Health, Environment and Justice has developed this fact pack on Cellular Phone Towers and Cell Phones in response to the numerous requests for information that we have had on this topic. This fact pack includes three types of information:

- Selections from issue papers describing the debate around public health, legislation and regulations of cellular phone towers.
- Most recent health studies and exposure issues of electromagnetic fields (EMFs) emitted from cellular phone towers.
- News clips describing community struggles to address problems posed by cellular towers and mobile phones.
- A section on cell phones featuring problems relating to health and disposal.

We have included materials from nonprofit organizations, government agencies, consulting companies, newspapers, and journals in an effort to provide a thorough introduction to the issues. We have included the abstracts of several technical reports that highlight what we believe is important information. The full text of these reports can be found on the web sites listed on the respective information.

We intend this fact pack to be a tool to assist you in educating yourself and others. We do not endorse the conclusions of the government and consulting reports in this fact-pack. We've included them because they provide valuable information describing the long-standing scientific uncertainty over EMF health effects typically found in cell towers and how these towers impact the surrounding community.

Our hope is that reading this fact pack will be the first step in the process of empowering your community to protect itself from environmental health threats. CHEJ can help with this process. Through experience, we've learned that there are four basic steps you'll need to take:

1. Form a democratic organization that is open to everyone in the community facing the problem.

2. Define your organizational goals and objectives.

3. Identify who can give you what you need to achieve your goals and objectives. Who has the power to block or shut down the facility? Do a health study? Get more testing done? It might be the head of the state regulating agency, city council members, or other elected officials.

4. Develop strategies that focus your activities on the decision makers, the people or person who has the power to give you what you are asking for.

CHEJ can help with each of these steps. Our mission is to help communities join together to achieve their goals. We can provide guidance on forming a group, mobilizing a community, defining a strategic plan, and making your case through the media. We can refer you to other groups that are fighting the same problems and can provide technical assistance to help you understand scientific and engineering data and show you how you can use this information to help achieve your goals.

If you want to protect yourself, your family, and your community, you need information, but equally important is the need to organize your community efforts.

Thank you for contacting us.

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American Academy of Environmental Medicine Recommendations Regarding Electromagnetic and Radiofrequency Exposure

Physicians of the American Academy of Environmental Medicine recognize that patients are being adversely impacted by electromagnetic frequency (EMF) and radiofrequency (RF) fields and are becoming more electromagnetically sensitive.

The AAEM recommends that physicians consider patients' total electromagnetic exposure in their diagnosis and treatment, as well as recognition that electromagnetic and radiofrequency field exposure may be an underlying cause of a patient's disease process.

Based on double-blinded, placebo controlled research in humans,[1] medical conditions and disabilities that would more than likely benefit from avoiding electromagnetic and radiofrequency exposure include, but are not limited to:

- Neurological conditions such as paresthesias, somnolence, cephalgia, dizziness, unconsciousness, depression
- Musculoskeletal effects including pain, muscle tightness, spasm, fibrillation
- Heart disease and vascular effects including arrhythmia, tachycardia, flushing, edema
- Pulmonary conditions including chest tightness, dyspnea, decreased pulmonary function
- Gastrointestinal conditions including nausea, belching
- Ocular (burning)
- Oral (pressure in ears, tooth pain)
- Dermal (itching, burning, pain)
- Autonomic nervous system dysfunction (dysautonomia).

Based on numerous studies showing harmful biological effects from EMF and RF exposure, medical conditions and disabilities that would more than likely benefit from avoiding exposure include, but are not limited to:

- Neurodegenerative diseases (Parkinson's Disease, Alzheimer's Disease, and Amyotrophic Lateral Sclerosis. [2-6]
- Neurological conditions (Headaches, depression, sleep disruption, fatigue, dizziness, tremors, autonomic nervous system dysfunction, decreased memory, attention deficit disorder, anxiety, visual disruption). [7-10]
- Fetal abnormalities and pregnancy. [11,12]
- Genetic defects and cancer.[2,3,13-19]
- Liver disease and genitourinary disease.[12,20]

Because Smart Meters produce Radiofrequency emissions, it is recommended that patients with the above conditions and disabilities be accommodated to protect their health. The AAEM recommends: that no Smart Meters be on these patients' homes, that Smart Meters be removed within a reasonable distance of patients' homes depending on the patients' perception and/or symptoms, and that no collection meters be placed near patients' homes depending on patients' perception and/or symptoms.

Submitted by: Amy L. Dean, DO and William J. Rea, MD

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Cell Phone Radiation Linked to Behavior Problems in Mice
By KIM CAROLLO
March 15, 2012— abcnews.go.com

Radiation Exposure Affected Part of Brain Linked to ADHD

A new study could re-ignite the debate over the potentially dangerous effects of cell phone radiation on children's behavior.

Researchers from the Yale School of Medicine found that exposing pregnant mice to radiation from a cell phone affected the behavior of their offspring later. They found that the mice exposed to radiation as fetuses were more hyperactive, had more anxiety and poorer memory -- symptoms associated with attention deficit hyperactivity disorder (ADHD) -- than mice who were not exposed to radiation.

Neurological tests revealed that the radiation exposure led to abnormal development of neurons in the part of the brain linked to ADHD, leading the authors to suggest that cell phone radiation exposure may play a role in the disorder.

"During critical windows in neurogenesis, the brain is susceptible to numerous environmental insults; common medically relevant exposures include ionizing radiation, alcohol, tobacco, drugs and stress," wrote the authors, led by Dr. Hugh Taylor, professor and chief of the Division of Reproductive Endocrinology and Infertility.

They added that while their study provides "the first experimental evidence of neuropathology due to in-utero cellular telephone radiation," the data are not conclusive, and more research is needed to determine the effects of radiation on humans or non-human primates.

Dr. F. Sessions Cole, professor of pediatrics and chief of newborn medicine at Washington University School of Medicine, in St. Louis, said that while the research is "provocative," the data are a long way from being applicable to humans.

"Mice are very different than humans," he said. "The distance the phone was placed away from the mice in the study was between 4 and 20 centimeters, which is a very short distance compared to the distance from the ear to the womb in humans. It's likely the dose of radiation the mice received is much greater than what a human fetus would receive."

Cole added that mice also have a much shorter gestation period, only 19 or 20 days, which can also mean a very different type of exposure than humans.

Much Study, But Few Definitive Conclusions

There have been a number of studies that looked at how cell phone radiation can possibly affect humans in different ways, from the development of cancer to behavior problems. Data have been inconclusive so far, and there has been no evidence of causation.

A 2010 study of more than 28,000 Danish children found that exposure to cell phones both before and after birth increased the risk for behavior problems.

Similar research back in 2008 sounded alarms in the media when news outlets reported that a particular study found that using mobile phones can cause serious harm to babies.

That study did find that Danish mothers who used cell phones during pregnancy reported more behavioral problems in their children, but the author said it was merely an association.

"That's clearly not what we wanted to suggest, and we think that there is no reason that pregnant women should be very alarmed at the findings we have," the lead author, Dr. Jorn Olsen of UCLA, told ABC News at the time the study was published.

There have also been several studies that examined the link between cell phones and cancer in children and adults, which also yielded inconsistent findings.

"There's been a lot of work on this subect, and it's been pretty exhaustively demonstrated that cell phone radiation does not affect human health," said Cole.

A European study published in October found that cell phone users were not at higher risk for cancer, although the research couldn't definitively rule that risk out. This research came just months after the World Health Organization said cell phones were a possible cause for cancer.

The American Cancer Society's position is that there could be some cancer risk, but supporting evidence is not very strong. The agency urges people who are concerned to limit cell phone use, especially among children.

Risk Concerning to Some

But the Environmental Health Trust, a charitable organization whose mission is to educate the public about health risks in the environment, says the evidence from multiple studies shows there is reason to be concerned about the effects of cell phones.

They urge people to keep phones away from their head and their body when they are in standby mode and to avoid using them when the signal is weak. The group is also calling for more long-term research exploring the issue further.

And almost every phone manufacturer includes warnings in packaging urging users to take precautions.

The authors of the current study hope their findings will contribute to the understanding of how childhood behavior problems develop.

"The rise in behavioral disorders in developed countries may be, at least in part, due to a contribution from fetal cellular telephone radiation exposure," they wrote. "Further testing is warranted in humans and non-human primates to determine if the risks are similar and to establish safe exposure limits during pregnancy."

FCC Plans to Review Cell Phone Radiation Safety

28 Jun, 2012 14:00 CET

As the debate over the safety of radiation emitted from cell phones rages on, the U.S. Federal Communications Commission (FCC) plans to review the safety of the mobile devices for the first time in more than a decade.

The FCC last updated its guidelines for the maximum radiation-exposure level in cell phones in 1996, according to *Bloomberg News*. It bases the limit on the amount of heat that cell phones emit. In 1996, there were 44 million mobile phone users in the U.S. Today there are 332 million subscribers, according to CTIA - The Wireless Association, a trade group.

Cell phones are being used for a longer time and more calls are being made by users now than ever before. Concerns about health impacts have grown with the use of mobile phones.

The National Cancer Institute says that radio frequency energy from cell phones held close to the head may affect the brain and other tissues.

Other studies have also found that cell phone radiation may be harmful. One new study released earlier this year suggested that cell phone use during pregnancy may be harmful to the health of unborn babies.

However, the FCC's website says the link between radio-frequency energy from cell phones has not been conclusively linked with health problems, according to *Bloomberg*.

If you or a loved one has been harmed by an unsafe product, contact Sokolove Law for a free legal consultation and to find out if a product liability lawyer may be able to help you. For legal help, call (800) 581-6358.

Sokolove Law

http://www.cisionwire.com/sokolove-law/r/fcc-plans-to-review-cell-phone-radiation-safety,c9278253

DRAFT 10.10.2006

CONSENSUS STATEMENT ON ELECTROMAGNETIC RADIATION

We, the undersigned, are members of the CHE-EMF Working Group within the Collaborative on Health and the Environment (CHE), together with like-minded colleagues from science, medicine and environmental health.

We believe there are legitimate health concerns regarding exposure to radiofrequency electromagnetic radiation (EMR), which has rapidly become one of the most pervasive environmental exposures in modern life. These concerns are based on the weight of evidence spanning decades of scientific research on radiofrequency (RF) radiation from countries around the world. The radiofrequency radiation sources addressed in this Consensus Statement are those from newer wireless technologies such as cell phones and cordless phones, cell towers/antennas, WI-FI networks, WI-MAX, as well as Broadband Radiofrequency Internet over electrical power lines (BPL).

We recognize that there are significant uncertainties about the long-term health effects of exposure to radiofrequency radiation. However, prudent policy requires acting on the best available scientific evidence. Then, based on the Precautionary Principle, which is an overarching guide for decision making when dealing with credible threats of harm and scientific uncertainty, policies to protect public health can be adopted.

As a way of implementing the Precautionary Principle, there should be an ongoing investment in research, as well as funding for a transparent, participatory policy analysis of alternatives, when there is reason to believe that there may be a significant risk from current or proposed technologies. The principle states that "when an activity raises threats of harm to the environment or human health, precautionary measures should be taken even if some cause-and-effect relationships are not fully established scientifically." These precautionary measures may include but are not necessarily limited to making investments in research and policy analysis. We are deeply concerned that there is insufficient non-industry funding support for critical research, given the potential public health consequences of involuntary and chronic exposure to radiofrequency radiation.

The following four examples show how the Precautionary Principle has been implemented.

1. Scientists in the United Kingdom recommend that no child under the age of 8 years old use a cell phone. Research evidence shows that children are more vulnerable than adults to harm from other environmental exposures (such as chemicals), and the same may be true of radiofrequency radiation exposures.
2. The International Association of Fire Fighters passed a resolution in 2004, calling for a moratorium on new cell phone antennas on fire stations and a study of the health effects of these installations.
3. The Chairman of the Russian National Committee for Non-Ionizing Radiation Protection (RNCNIRP), Yuri Grigoriev, advised that cellular communication is strongly contraindicated for children and teenagers.

DRAFT 10.10.2006

4. The Canadian Public Health Officer, David Butler-Jones, advised Canadians to limit their and their children's use of cell phones until science resolves uncertainties about long-term health effects.

More research is needed on the health/biological effects, the level of current and future exposure, and the feasibility, cost and exposure implications of these technologies, as well as alternatives and modifications to current technology.

While research continues, we believe there is sufficient evidence to recommend precautionary measures that people can take to protect their health, and the health of their families, co-workers and communities. We recommend the following measures:

- Use a corded phone/land line if possible, which does not involve RF exposure. Emergency use of cell phones is not discouraged but land lines should be used for normal day-to-day communication needs.

- If you use a cell phone, use an earpiece/headset or the "speaker phone" setting, which greatly reduces the RF exposure because the phone is not held next to your head and brain. Using text messaging is also a good way to reduce RF exposure.

- Be aware that the cell phone radiates to some degree even when in "standby" mode. You can avoid this radiation by either keeping the phone off (using it as an answering machine), or away from your body.

- Using a cordless phone outdoors to alert you to an incoming call is handy, but returning inside to use a corded phone/land line to conduct the conversation is advisable.

- Before adopting WI-FI wireless networks in workplaces, schools and cities, the extent of exposure and possible health effects should be publicly discussed. Although convenient, WI-FI wireless networks create pervasive, continuous, involuntary exposure to radiofrequency radiation. Preferable alternatives to wireless technology for voice and data transmission, including cable and fiber-optic technologies (that produce no radiofrequency radiation), should be considered, given the uncertainties about health, cost, liability, and inequity of impact.

- There needs to be substantial community involvement in decisions about the placement and operation of cell towers (also called antennas or masts). Where possible, siting of these facilities should avoid residential areas and schools, day-care centers, hospitals and other buildings that house populations more vulnerable to the effects of radiation exposure. Periodic information on levels of exposure should be provided to the public. Cell towers produce radiofrequency radiation exposure in communities that is constant and involuntary. While acknowledging that this technology enables voice and data transmission via a cell phone that is important to many people in every community, those who live, work or go to school in the vicinity of wireless facilities will be disproportionately exposed. Not enough research has been done to determine the safety or risk of chronic exposure to low-intensity RF radiation from cell towers and some studies suggest there may be harm.

- Broadband Radiofrequency Internet transmitted over electrical power lines (BPL) needs to be thoroughly researched and the findings publicly disclosed and discussed before full deployment of this new technology. Discussion should include comparison of exposures and potential health effects of BPL technology versus cable and fiber optics. BPL technology uses electrical wiring as the vehicle for carrying RF radiation into and throughout all electrified buildings in a community, including every home. Therefore, BPL has the potential to expose entire communities to a new, continuous, involuntary source of RF radiation. The RF signal will be carried on everyone's home wiring, even in the homes of those who do not wish to subscribe to this new Internet service. People will have no chance to "opt out" or turn off the signal.

In summary, we recommend caution in the further deployment of wireless technologies, and deployment of safer, wired alternatives until further study allows better definition of the risks of wireless.

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See next page for international resolutions urging precaution with wireless technologies.

International Resolutions Advocating a Precautionary Approach to the Use and Expansion of Wireless Technologies

Scientists and public policy researchers across the globe have acknowledged the evidence of potential health effects from radiofrequency radiation and advocated a precautionary approach to the use and expansion of wireless technologies. For example:

- October 1998, scientists adopt the Vienna Resolution, which states that "biological effects from low intensity [RFR] exposures are scientifically established." www.emrnetwork.org/research/vienna.htm
- June 2000, scientists adopt the Salzburg Resolution, stating "the assessment of biological effects of exposures from base stations in the low-dose range is difficult but indispensable for protection of public health…there is at present evidence of no threshold for adverse health effects." In other words, there is no threshold for safe exposure. http://www.salzburg.gv.at/salzburg_resolution_e.pdf
- May 2000, the UK Independent Expert Group on Mobile Phones chaired by Sir William Stewart, reports that "a precautionary approach be adopted until more robust scientific information becomes available." www.iegmp.org.uk
- September 2002, scientists at the International Conference "State of the Research on Electromagnetic Fields Scientific and Legal Issues" held in Catania, Italy, adopt the Catania Resolution, calling for "preventive strategies based on the precautionary principle." http://www.emrpolicy.org/faq/catania.pdf
- November 2004, the European Union's EMF REFLEX Research Project is released, showing that mobile phone radiation (radiofrequency radiation) damages DNA in human cells. http://omega.twoday.net/stories/436261 http://www.itis.ethz.ch/downloads/REFLEXFinal%20Report171104.pdf
- In January 2005, the UK National Radiation Protection Board issues a warning that no child under age 8 should use a cell phone, citing the growing scientific evidence that exposure to RFR poses a health risk. The report also cautions about the health risks of exposure to cell phone antennas (referred to as "base stations): *"…there remain particular concerns in the UK about the impact of base stations on health, including well-being. Despite current evidence which shows that exposures of individuals are likely to be only a small fraction of those from phones, they may impact adversely on well-being."* http://www.hpa.org.uk/radiation/publications/documents_of_nrpb/abstracts/absd15-5.htm
- In February 2005, the Irish Doctors Environmental Association (IDEA) issues a statement urging that "the strictest possible safety regulations be established for the installation of masts and transmitters, and for the acceptable levels of potential exposure of individuals to electromagnetic radiation." http://www.ideaireland.org/emr2005dailreport.htm
- In September 2006, the International Commission for Electromagnetic Safety (ICEMS) releases the Benevento Resolution which emphasizes that the accumulated evidence points to "adverse health effects from occupational and public exposures to electric, magnetic and electromagnetic fields

(EMF) at current exposure levels." Signed by 31 leading scientists from around the world, this resolution calls for governments to "adopt guidelines for public and occupational EMF exposure that reflect the Precautionary Principle." http://www.icems.eu

A pdf version of this statement is available for download from: **www.healthandenvironment.org**

University of Albany, New York– August 31 / **Serious Public Health Concerns Raised Over Exposure to Electromagnetic Fields (EMF) from Power Lines and Cell Phones**

An international working group of scientists, researchers and public health policy professionals (The BioInitiative Working Group) has released its report on electromagnetic fields (EMF) and health. It raises serious concern about the safety of existing public limits that regulate how much EMF is allowable from power lines, cell phones, and many other sources of EMF exposure in daily life.

Electromagnetic radiation from such sources as electric power lines, interior wiring and grounding of buildings and appliances are linked to increased risks for childhood leukemia and may set the stage for adult cancers later in life. A report from the BioInitiative Working Group (www.bioinitiative.org) released on Friday, August 31st documents the scientific evidence that power line EMF exposure is responsible for hundreds of new cases of childhood leukemia every year in the United States and around the world.

The report provides detailed scientific information on health impacts when people are exposed to electromagnetic radiation hundreds or even thousands of times below limits currently established by the Federal Communications Commission (US FCC) and International Commission for Non-Ionizing Radiation Protection in Europe (ICNIRP). The authors reviewed more than 2000 scientific studies and reviews, and concluded that the existing public safety limits are inadequate to protect public health. From a public health policy standpoint, new public safety limits, and limits on further deployment of risky technologies are warranted based on the total weigh of evidence.

The report documents scientific evidence raising worries about childhood leukemia (from power lines and other electrical exposures), brain tumors and acoustic neuromas (from cell and cordless phones) and Alzheimer's disease. There is evidence that EMF is a risk factor for both childhood and adult cancers.

Public health expert and co-editor of the Report Dr. David Carpenter, Director, Institute for Health and the Environment at the University of Albany, New York says "*this report stands as a wake-up call that long-term exposure to some kinds of EMF may cause serious health effects. Good public health planning is needed now to prevent cancers and neurological diseases linked to exposure to power lines and other sources of EMF. We need to educate people and our decision-makers that "business as usual" is unacceptable*."

Health questions about power line EMFs were initially raised by Nancy Wertheimer, a Colorado public health expert and Ed Leeper, an electrical engineer in 1979. Wertheimer noticed that children were twice or three times as

likely to have leukemia tended to live in homes in the Denver, CO area close to power lines and transformers. Now, there are dozens of studies confirming the link, but public health response has been slow in coming, and new standards to protect the public are necessary.

Brain tumor specialist Dr. Lennart Hardell, MD, PhD and Professor at University Hospital in Orebro, Sweden is a member of the BioInitiative Working Group. His work on cell phones, cordless phones and brain tumors is widely recognized to be pivotal in the debate about the safety of wireless radiofrequency and microwave radiation. *"The evidence for risks from prolonged cell phone and cordless phone use is quite strong when you look at people who have used these devices for 10 years or longer, and when they are used mainly on one side of the head*.

Brain tumors normally take a long time to develop, on the order of 15 to 20 years. Use of a cell or cordless phone is linked to brain tumors and acoustic neuromas (tumor of the auditory nerve in the brain) and are showing up after only 10 years (a shorter time period than for most other known carcinogens). "*This indicates we need research on more long-term users to understand the full risks"* says Dr. Hardell.

Dr. Hardell's work has been confirmed in other studies on long-term users. A summary estimate of all studies on brain tumors shows overall a 20% increased risk of brain tumor (malignant glioma) with ten years of use. But the risk increases to 200% (a doubling of risk) for tumors on the same side of the brain as mainly used during cell phone calls. *"Recent studies that do not report increased risk of brain tumors and acoustic neuromas have not looked at heavy users, use over ten years or longer, and do not look at the part of the brain which would reasonably have exposure to produce a tumor."*

Wireless technologies that rely on microwave radiation to send emails and voice communication are thousands of times stronger than levels reported to cause some health impacts. Prolonged exposure to radiofrequency and microwave radiation from cell phones, cordless phones, cell towers, WI-FI and other wireless technologies have linked to physical symptoms including headache, fatigue, sleeplessness, dizziness, changes in brainwave activity, and impairment of concentration and memory. Scientists report that these effects can occur with even very small levels of exposure, if it occurs on a daily basis. Children in particular are vulnerable to harm from environmental exposures of all kinds.

Co-editor of the report, Cindy Sage of Sage Associates says *"public health and EMF policy experts have now given their opinion of the weight of evidence. The existing FCC and international limits for public and occupational exposure to electromagnetic fields and radiofrequency radiation are not protective of public health. New biologically-based public and occupational exposure are*

recommended to address bioeffects and potential adverse health effects of chronic exposure. These effects are now widely reported to occur at exposure levels significantly below most current national and international limits."

Biologically-based exposure standards are needed to prevent disruption of normal body processes. Effects are reported for DNA damage (genotoxicity that is directly linked to integrity of the human genome), cellular communication, cellular metabolism and repair, cancer surveillance within the body; and for protection against cancer and neurological diseases. Also reported are neurological effects including changes in brainwave activity during cell phone calls, impairment of memory, attention and cognitive function; sleep disorders, cardiac effects; and changes in immune function (allergic and inflammatory responses).

Sage says *"the Working Group recommends a biologically-based exposure limit that is protective against extremely-low frequency (power line) and radiofrequency fields which, with chronic exposure, can reasonably be presumed to result in significant impacts to health and well-being".*

Contributing author Dr. Martin Blank, Columbia University professor and researcher in bioelectromagnetics says *"cells in the body react to EMFs as potentially harmful, just like to other environmental toxins, including heavy metals and toxic chemicals. The DNA in living cells recognizes electromagnetic fields at very low levels of exposure; and produces a biochemical stress response. The scientific evidence tells us that our safety standards are inadequate, and that we must protect ourselves from exposure to EMF due to powerlines, cell phones and the like."* He wrote the section on stress proteins for the BioInitiative Report.

Contact: info@bioinitiative.org (open on August 31, 2007)

Report: available at www.bioinitiative.org (on August 31, 2007)

Title: BioInitiative: A Rationale for a Biologically-based Public Exposure Standard for Electromagnetic Fields (ELF and RF)

What are the Dangers of Living Near Cell Phone Towers?

by www.SixWise.com

Over 190 million cell phones are in use in the United States, with users often scrambling to another room, building or street to get better reception. As consumers, it is frustrating when your cell phone reception gets dropped or is too garbled to hear. But beyond "Can you hear me now?" is another considerably more important question:

Are the cell towers and antennas popping up all over the country - -the very ones that we depend on for clear reception and a wide coverage area -- safe?

This may have been a moot issue in the past when the towers were sparse and limited to obscure cornfields and hilltops. But the number of these cell "sites," as they're called, has increased tenfold since 1994. Among the more than 175,000 cell sites in the United States are antennas on schools, churches, firehouses, cemeteries and national parks. There's even a cell tower near Old Faithful in Yellowstone.

Health, not aesthetics, is the primary reason why residents oppose cell phone towers in their towns.

"Don't Put That Tower Here"

"Our companies are always running into this conundrum, which is, 'We want cell phone service, but don't put that tower here.' When you're dealing with communications through the air, you have to have antennas and towers," said Joe Farren, a spokesman for CTIA-The Wireless Association, the industry's trade group.

Aesthetics aside, the primary reason most people don't want cell sites near their homes and communities is because they're afraid of the potential health effects.

Already, more than 500 cases have sprung up across the country in which people have tried to stop cell phone sites from being constructed, according to Washington attorney Ed Donohue, who represents several cell phone companies.

Most of the time, the cell phone companies win because, as it stands, federal law does not allow rejection of a tower based on health risks.

Cell Phone Towers: Risky or Not?

If you ask the government, no studies have shown conclusive evidence that radio-frequency emissions, a form of electromagnetic radiation (EMR), from cell towers are harmful.

According to the Food and Drug Administration:

> "RF [Radio frequency] exposure on the ground is much less than exposure very close to the antenna and in the path of the transmitted radio signal. In fact, ground-level exposure from such antennas is typically thousands of times less than the exposure levels recommended as safe by expert organizations. So exposure to nearby residents would be well within safety margins."

Cell phone companies also maintain that no risks exist from the towers. "There are no health risks posed by the towers. Independent scientific panels around the world have reached this conclusion," said Russ Stromberg, senior manager of development at T-Mobile.

But other studies seem to tell a different story, with findings such as:

- A study by Dr. Bruce Hocking in Australia found that children living near three TV and FM broadcast towers (similar to cell towers) in Sydney had more than twice the rate of leukemia than children living more than seven miles away.
- Says Dr. Neil Cherry, a biophysicist at Lincoln University in New Zealand:
    - "Public health surveys of people living in the vicinity of cell site base stations should be being carried out now, and continue progressively over the next two decades. This is because prompt effects such as miscarriage, cardiac disruption, sleep disturbance and chronic fatigue could well be early indicators of the adverse health effects. Symptoms of reduced immune system competence, cardiac problems, especially of the arrhythmic type, and cancers,

especially brain tumor and leukemia, are probable."

- Biomedical engineer Mariana Alves-Pereira says exposure to cell phone towers can lead to vibroacoustic disease. "From what I understand, some of the complaints are similar in what is seen in vibroacoustic disease patients, which are people who develop a disease caused by low frequency noise exposure," she said. Symptoms can include mood swings, indigestion, ulcers and joint pain.
- Dr. Gerard Hyland, a physicist who was nominated twice for the Nobel Prize in medicine, says, "Existing safety guidelines for cell phone towers are completely inadequate ... Quite justifiably, the public remains skeptical of attempts by governments and industry to reassure them that all is well, particularly given the unethical way in which they often operate symbiotically so as to promote their own vested interests."
- According to the Mount Shasta Bioregional Ecology Center, "Studies have shown that even at low levels of this radiation, there is evidence of damage to cell tissue and DNA, and it has been linked to brain tumors, cancer, suppressed immune function, depression, miscarriage, Alzheimer's disease, and numerous other serious illnesses."
- According to Dr. W. Löscher of the Institute of Pharmacology, Toxicology and Pharmacy of the Veterinary School of Hannover in Germany, dairy cows that were kept in close proximity to a TV and cell phone tower for two years had a reduction in milk production along with increased health problems and behavioral abnormalities. In an experiment, one cow with abnormal behavior was taken away from the antenna and the behavior subsided within five days. When the cow was brought back near the antenna, the symptoms returned.

Incentives for Cell Phone Towers

Why would a church, school or other private property allow a cell phone antenna to be placed on the grounds? Cell phone companies pay "rent" for their placement that can range anywhere from $800 to $2,000 a month. This can mean all the difference for an under-funded school district or church.

Still, many people are wary that the incentives do not come close to matching the potential risk involved. This includes the International Association of Fire Fighters who, in 2004, came out against the use of firehouses for cell antennas "until a study with the highest scientific merit" can prove they are safe.

These sentiments are echoed by residents of St. Louis where T-Mobile plans to put a cell site on an 89-year-old church. "That revenue is in exchange for our potential well-being, our peace of mind and our property values," said resident David O'Brien. "None of us are willing to take that risk."

Recommended Reading

Noise Pollution: How Bad is it, How Bad Could it Get, What are the Effects?

Bottled Water: Which City's Tap Water System is Making a Flood of Cash off of You?

Sources

Food and Drug Administration: Cell Phone Facts

Health Effects Associated With Mobile Base Stations in Communities

Are Cell Phone Towers Making You Sick?

Mount Shasta Bioregional Ecology Center

Wired News: Cell Phone Tower Debate Grows

Extraordinary Behaviors in Cows in Proximity to Transmission Towers

Cell Towers

Wireless Convenience? or Environmental Hazard?

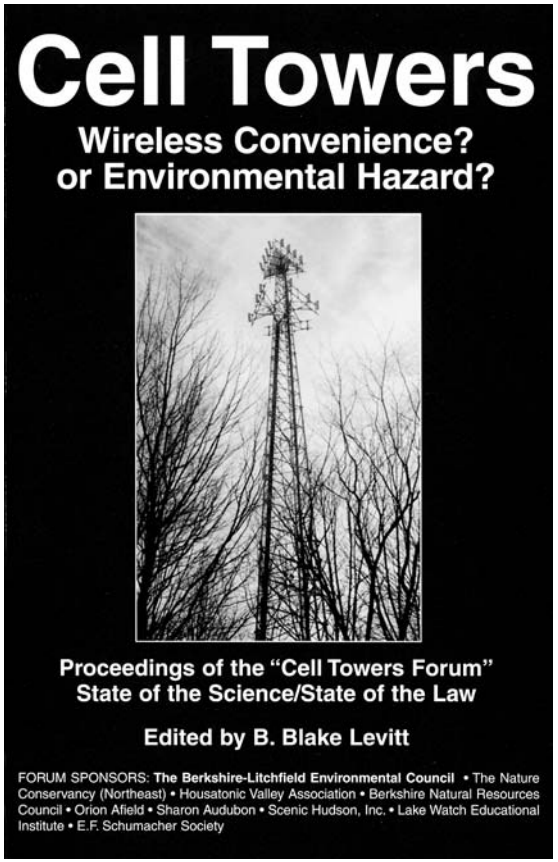
Edited by B. Blake Levitt

Cell towers and hidden "stealth" antennas are cropping up all over, despite vehement objections from community members. Health and safety questions arise, and are often dismissed by the very people entrusted to protect community welfare—planners and zoners—who have been told they cannot consider such questions. Safety concerns about radio frequency radiation (RF) used in all wireless technology spans decades. These concerns have yet to be resolved, despite increasing exposure.

- Are health concerns justified?
- What are the roles of the lead government agencies: EPA & FCC?
- Are the RF exposure standards reliable? Are they current?
- What are other countries doing?
- Are humans the only concern? What about the millions of birds killed annually when they collide with towers?
- What about property devaluation? Liability? Case law?
- What can communities do? What are good zoning regulations?
- Are we on an environmental collision course with ambient energy?

Cell Towers cuts through the rhetoric to address the complex issue of low-level RF. With chapters contributed by prominent research scientists, government officials, engineers and attorneys the book is the most comprehensive and balanced resource available for laypeople today.

As significant for Americans in the New Century as Rachel Carson's *Silent Spring* was in the 1960s.



"Finally a publication dealing with the very timely and important issue of cell towers. Following Levitt's excellent overview of the problem, the book takes us through relevant scientific and regulatory issues in a thorough, easy-to-understand manner. This book is an essential reference work for laypersons as well as those in science, policy development, regulation, and legislation."

Jerry L. Phillips, Ph.D.—Bioelectromagnetics consultant; former Research Scientist, Cancer Therapy and Research Center, San Antonio, Texas, and Pettis Memorial VA Hospital, Loma Linda, California.

"Continued proliferation of this radiation constitutes one of the most significant alterations of the natural environment, with the possibility of major impacts on human health. Ms. Levitt's compilation of the presentations of the Cell Towers Forum—along with additional scientific evidence, up-to-date regulatory provisions and abstracts of pertinent legal decisions—is unbiased, authoritative and represents the opinions of recognized experts in the bio-effects of electromagnetic radiation. This book should be required reading for all planning boards, environmental groups and concerned citizens."

Robert O. Becker, M.D.—Biomedical consultant; author of *The Body Electric* and *Cross Currents.*

355 pages; 6" x 9"; 64 photos, 22 diagrams

B. Blake Levitt is an award-winning medical and science journalist. A former *New York Times* writer, she is the author of *Electromagnetic Fields, A Consumer's Guide to the Issues and How to Protect Ourselves* for which she won an Award of Excellence from the American Medical Writers Association

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Cell Phones and Cancer Risk

Key Points

- Cell phones emit radiofrequency energy. Concerns have been raised that this energy from cell phones may pose a cancer risk to users (see Question 1).
- Radiofrequency energy is a form of non-ionizing electromagnetic radiation; exposure depends upon the technology of the phone, distance between the phone's antenna and the user, the extent and type of use, and distance of the user from base stations (see Question 2).
- Researchers are studying tumors of the brain and central nervous system and other sites of the head and neck because cell phones are typically held next to the head when used (see Question 3).
- Research studies have not shown a consistent link between cell phone use and cancer. A large international study (Interphone) published in 2010 found that, overall, cell phone users are at lower risk for two of the most common types of brain tumor—glioma and meningioma—compared to non-users. For the small proportion of study participants who reported the most total time on cell phone calls, there was some increased risk of glioma, but the researchers considered this finding inconclusive (see Question 3).
- Further research is needed to investigate possible health effects in children and persons who have used cell phones heavily for many years.

1. Why is there concern that cell phones may cause cancer or other health problems?

There are three main reasons why people are concerned that cell phones (also known as "wireless" or "mobile" telephones) may cause certain types of cancer or other health problems:

- The number of cell phone users has increased rapidly. As of 2010, there were more than 303 million subscribers to cell phone service in the United States, according to the Cellular Telecommunications and Internet Association. This is an increase from 110 million users in 2000. Globally, the number of cell phone subscriptions is estimated to be 5 billion.

- Over time, the number of cell phone calls per day, the length of each call, and the duration of use of cell phones have increased and cell phone technology has undergone substantial change. Cell phone use began in Japan in 1979, in Nordic countries in Europe in 1981, and in the United States in 1983, but cell phones were not widely used in the United States until the 1990s.

- Cell phones emit radiofrequency energy (radio waves), which is a form of non-ionizing radiation. The tissues next to where the phone is held absorb this energy. Potential health effects of radiofrequency exposure from cell phones, radar, satellite stations, microwave ovens, and other sources have been studied for many years.

2. What is radiofrequency energy, how can it affect the body, and how is it measured in epidemiologic studies?

Radiofrequency energy is a form of electromagnetic radiation. Electromagnetic radiation can be divided into two types: ionizing (x-rays, radon, cosmic rays) and non-ionizing (radiofrequency, extremely low-frequency or power frequency). *Ionizing* radiation, such as that produced by x-ray machines, can pose a cancer risk. There is currently no consistent evidence that *non-ionizing* radiation emitted by cell phones is associated with cancer risk.

When a call is placed from a cell phone, the antenna of the phone sends a signal to the nearest base station antenna. The base station routes the call through a switching center, where the call can be transferred to another cell phone, another base station, or the local land-line telephone system.

How does radiofrequency energy affect the body? The farther a cell phone is from a base station antenna, the higher the power level needed to maintain a connection. The amount of radiofrequency energy exposure to the user decreases significantly with increasing distances between the phone's antenna and the user, and, to a lesser extent, shorter distances between the phone and a base station. A cell phone user's level of exposure depends on several factors, including the following:

- The number and duration of calls
- The amount of cell phone traffic at a given time
- The distance from the nearest base station
- The quality of the cellular transmission
- The size of the handset
- For older phones, how far the antenna is extended
- Whether or not a hands-free device is used

The only known biologic effect of radiofrequency energy is heating. A form of this kind of energy is used by microwave ovens. Although high doses of radiofrequency energy cause localized tissue heating, the level of radiofrequency exposure from cell phone use is not sufficient to increase body temperature. There is no consistent evidence that radiofrequency exposure can produce other serious health effects, including cancer. However, more research is needed to determine what effects, if any, this energy has on the body.

How is radiofrequency energy measured in epidemiologic studies? Two strategies have been used to estimate radiofrequency levels in epidemiologic studies. Radiofrequency levels are estimated by assessing the following information from in-person interviews or self-administered questionnaires:

- Whether the subject was a "regular" user (minimum number of calls per week/month)
- The age/year of first use and age/year of last use (duration of use and time since start of use)
- The average number of cell phone calls per day/week/month (frequency)
- The average length of a typical cell phone call
- Total hours of lifetime use, calculated from length of typical call times, number of calls per period, and duration of use

3. Do cell phones cause cancer? What is the scientific evidence, and what do expert reviewers conclude?

There is concern that radiofrequency energy produced by cell phones may affect the brain and other tissues in the head because hand-held cell phones are usually operated close to the head. Researchers have focused on whether radiofrequency energy can cause malignant (cancerous) brain tumors, such as gliomas as well as benign (noncancerous) tumors, such as acoustic neuromas (tumors in the cells of the nerve responsible for hearing), meningiomas (tumors in the meninges, membranes that cover and protect the brain and spinal cord), and parotid gland tumors (tumors in the salivary glands). Researchers have investigated the possible role of cell phones or other sources of radiofrequency exposure and cancer risks in humans and animals. There are also experimental investigations assessing potential biologic or mechanistic effects by which radiofrequency exposure might lead to cancer.

Scientific evidence—human studies of cell phone use

The Interphone Study, a 13-country consortium of case-control studies of cell phone use and risk for malignant or benign brain tumors, is the largest study of long-term cell phone use. Interphone researchers found that cell phone users had reduced risks for glioma and meningioma overall, and they found no evidence of increasing risk with progressively increasing number of calls, longer call time, or years since beginning cell phone use. The small proportion of study participants who reported spending the most total time on cell phone calls (13 percent of people with brain tumors and 8 percent of those without tumors) experienced a statistically significant, albeit modest, increase in risk of glioma.

There was some indication that the association with glioma among heaviest users of cell phones was more apparent for phone use on the same side of the head as the tumor, but the authors noted that this could have been due to reporting bias. However, if the relationship were causal, it would translate into an increase from

the current age-adjusted incidence rate of brain cancer in the United States of about 6.5 cases per 100,000 people to about 9 cases per 100,000. The Interphone researchers considered this finding inconclusive due to implausible levels of use reported by a subset of the heaviest users. Interphone was coordinated by the International Agency for Research on Cancer (IARC).

Interphone and other case-control studies of acoustic neuroma. The individual studies of cell phone use and risk of acoustic neuroma are based on small numbers of cases. A pooled analysis of data from Interphone investigators from Denmark, Finland, Norway, Sweden, and the United Kingdom did not find relationships between the risk of acoustic neuroma and the duration of cell phone use, cumulative hours of use, or number of calls; however, the risk of a tumor on the same side of the head as the reported phone use was higher among persons who had used a cell phone for 10 years or more. A Swedish case-control study reported similar findings, but a Danish case-control study showed no increased risk in long-term (10 years or more) cell phone users compared with short-term users, and no increase in the incidence of tumors on the side of the head where the phone was usually held. Patients with a tumor on one side of their head might be more likely to report phone use on that side.

A cohort study in Denmark attempted to avoid some of the biases associated with case-control studies (see below in Question 4) by linking billing information from over 420,000 cell phone subscribers with brain tumor incidence data from the Danish Cancer Registry. Cell phone use was not associated with glioma, meningioma, or acoustic neuroma, even among persons who had been subscribers for 10 or more years. Although this approach does not provide direct data on cell phone frequency or duration of use, and the subscriber may not be the primary user of the phone, the prospective cohort design precludes the need to rely on recall of past cell phone use.

Most earlier case-control studies in the United States, Europe, and Japan generally did not demonstrate associations of cell phone use with glioma or meningioma, except for case-control studies in areas of Sweden which found statistically significant associations with cumulative use and latency that were highest in subjects with first use before the age of 20. See Question 4 for more information about why these studies may differ.

Case-control studies of tumors other than brain and central nervous system. There are very few human studies of the possible relationship between cell phone use and tumors other than those of the brain and central nervous system, such as tumors of the parotid gland.

Cancer trends over time. Incidence data from the Surveillance, Epidemiology and End Results (SEER) Program of the National Cancer Institute have shown no increase in the age-adjusted incidence of brain and other nervous system cancers between 1987 and 2007, despite the dramatic increase in the use of cell phones. Similarly, incidence data from Denmark, Finland, Norway, and Sweden for the period 1974-2003 revealed no increase in age-adjusted incidence of brain and other central nervous system tumors. If cell phones play a role in the risk of brain cancer, one might expect to see an increase in rates because average monthly hours of cell phone use have increased regularly for the past two decades in the United States and Nordic countries.

Scientific evidence—human studies of cancer risks associated with other sources of radiofrequency

Studies of workers exposed to radiofrequency have shown no evidence of increased risk of brain tumors among U.S. Navy electronics technicians, aviation technicians or fire control technicians, those working in an electromagnetic pulse test program, plastic-ware workers, cellular phone manufacturing workers, or Navy personnel with a high probability of exposure to radar.

Scientific evidence—animal and mechanistic studies

Scientists have not yet identified the mechanism by which radiofrequency energy might cause cancer. Exposure to radiofrequency energy does not appear to result in damage to DNA. To date, studies of rodents exposed to radiofrequency radiation provide no clear or consistent evidence that this type of radiation causes cancer, nor that it enhances the carcinogenicity of known chemical carcinogens.

The National Institute of Environmental Health Sciences, a part of NIH, is carrying out a study of risks related to exposure to radiofrequency radiation (the type used in cell phones) in highly specialized labs that can specify and control sources of radiation and measure their effects on rodents.

Conclusions of Expert Organizations

The International Agency for Research on Cancer (IARC), a component of the World Health Organization, has recently classified radiofrequency fields as "possibly carcinogenic to humans," based on limited evidence from human studies, limited evidence from studies of radiofrequency and carcinogenicity in rodents, and weak mechanistic evidence (from studies of genotoxicity, effects on immune function, gene and protein expression, cell signaling, oxidative stress, and apoptosis, along with studies of the possible effects of radiofrequency energy on the blood-brain barrier) (http://www.iarc.fr/en/media-centre/pr/2011/pdfs/pr208_E.pdf).

The American Cancer Society states that most studies to date have not found an association between cell phone use and development of tumors. However, results from these studies have been limited by the length of follow-up, changing patterns of cell phone usage and technology, lack of study of children, and methods for measuring cell phone use. Possible cancer risks of cell phone exposure should continue to be evaluated using high-quality methodological approaches, particularly in relation to use in childhood and adolescence and longer-term use (http://www.cancer.org/cancer/cancercauses/othercarcinogens/athome/cellular-phones).

The National Institute of Environmental Health Sciences (NIEHS) is currently conducting the largest laboratory rodent study to date on radiofrequency energy exposures in rodents; the studies are designed to mimic human exposure and are based on the frequencies and modulations of cell phones currently in use in the United States. NIEHS states that the weight of the current scientific evidence has not conclusively linked cell phones with any adverse health problems, but more research is needed (http://www.niehs.nih.gov/health/topics/agents/cellphones/index.cfm).

The U.S. Food and Drug Administration, which is responsible for regulating the safety of machines and devices that emit radiation (including cell phones), notes that studies reporting biological changes associated with radiofrequency energy have failed to be replicated and that the majority of human epidemiologic studies have failed to show an association between exposure to radiofrequency from cell phones and health problems (http://www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/HomeBusinessandEntertainment/CellPhones/default.htm).

The U.S. Centers for Disease Control and Prevention states that although some studies have raised concerns, the scientific research as a whole does not support a significant association between cell phone use and health effects (http://www.cdc.gov/nceh/radiation/cell_phones._FAQ.html).

The Federal Communications Commission concludes that there is no scientific evidence to prove that wireless phone usage can lead to cancer or a variety of other health problems, including headaches, dizziness, or memory loss (http://transition.fcc.gov/cgb/cellular.html).

4. Why are there inconsistencies among the studies?

Even among studies that show an association between cell phone use and cancer, the results are conflicting. Studies in Sweden have reported elevated risks at usage levels where Interphone finds no association. There are several possible reasons for discrepancies between some studies:

- Information about cell phone use, including the frequency of use and the duration of calls, has largely been assessed through questionnaires. The completeness and accuracy of the data collected during such interviews depend on the memory of the responding individuals. In case-control studies, individuals with brain tumors may remember cell phone use differently from healthy individuals, which can result in a problem known as *recall bias*.

- In the Interphone study, cell phone use among people who developed a brain tumor was more likely to be reported on the same side of the head as the brain tumor. Both low users and high users of cell phones reported this pattern, making the predominance of same-side-of-the-head use less likely to be causal; instead, the pattern may reflect over-reporting. Further, there's no reason to expect reduced risk of tumor occurrence among those using cell phones on the opposite side of the head, as reported in that study.

- Gliomas are particularly difficult to study in large part because of high mortality and short survival. Patients who survive initial treatment are often impaired, which may affect their responses. Furthermore, for cases who have died, next-of-kin are often less familiar with the cell phone use patterns of the affected family member and may not accurately describe patterns of use to an interviewer.

- Epidemiologic studies of cell phone use and brain cancer risk lack verifiable data about cumulative exposure over time (the total amount of radiofrequency energy individuals have encountered). These studies are also vulnerable to errors in the reporting of exposure by study participants.

- Study participation rates are frequently different between those with cancer and those without cancer in brain tumor studies, a problem known as *participation bias*. Some studies have indicated greater participation by individuals diagnosed with brain tumors compared with control subjects, and participation rates may be related to cell phone use. For example, the Interphone study reported participation rates of 78 percent for meningioma cases (range 56 to 92 percent for the individual studies), 64 percent (range 36 to 92 percent) for the glioma cases, and 53 percent (range 42 to 74 percent) for controls. The Swedish studies reported participation rates of 85 percent in cases and 84 percent in controls.

- The interval between exposure to a carcinogen and the clinical onset of a tumor may be many years or decades. Memory of events that occurred years to decades ago may be problematic. In case-control studies, it is not possible to prospectively monitor cases and controls for the length of time it might take for brain tumors to develop.

- Cellular technology continues to change. Although older studies evaluated radiofrequency energy exposure from analog telephones, most cell phones today use digital technology, which operates at a different frequency and a lower power level than analog phones.

- The use of "hands-free" wireless technology is increasing and may alter exposure.

Investigators from the Interphone study looked at potential sources of bias that could affect the conclusions of epidemiologic studies. They found lower frequency of regular cell phone use among control subjects than among patients with brain tumors, and they quantified how this difference might affect the study's results. They found moderate to high correlation between use that was measured (with special software-equipped phones) and recalled use. Light users were more likely to underestimate their use, and heavy users were more likely to overestimate their use and length of calls. A comparison of cell phone subscriber data with reported cell phone use from interviews revealed that both brain tumor patients and control subjects underestimated the number of calls and overestimated call duration.

5. What studies are still under way that will help further our understanding?

A large prospective cohort study of cell phone use and its possible long-term health effects was launched in Europe in March 2010. This study, known as COSMOS, will enroll approximately 250,000 cell phone users ages 18 or older and will follow them for 20 to 30 years. Participants in COSMOS will complete a questionnaire about their health, lifestyle, and current and past cell phone use. This information will be supplemented with information from health records and cell phone records. More information about the COSMOS study is available at http://www.ukcosmos.org/index.html.

The challenge of such an ambitious study is to maintain the cohort over many decades. Researchers will need to determine if those participants who leave the study are somehow different from those who remain throughout the follow-up period.

Although recall bias is minimized in studies that also link to cell phone records, such studies face other problems. For example, it is impossible to know who is using the cell phone or whether that individual may also place calls using other cell phones. To a lesser extent, it is not clear if multiple users of a single phone are represented on one bill.

6. Do children have a higher risk of developing cancer due to cell phone use than adults?

There are currently no data on cell phone use and risk of cancer in children. None of the published studies to date have included children. Cell phone use by children and adolescents is increasing rapidly, and they are likely to accumulate many years of exposure during their lives. In addition, children may be at greater risk because their nervous systems are still developing at the time of exposure. A large case-control study of

childhood brain cancer in several northern European countries is in progress. Researchers from the Centre for Research in Environmental Epidemiology in Spain are also conducting an international study—Mobi-Kids—to evaluate risk from new communications technologies (including cell phones) and other environmental factors in young people ages 10 to 24. More information about the Mobi-Kids study is available at http://www.mbkds.com.

7. What can cell phone users do to reduce their exposure to radiofrequency energy?

The Food and Drug Administration and the Federal Communications Commission have suggested some steps that cell phone users can take to reduce their exposure:

- Reserve the use of cell phones for shorter conversations or for times when a conventional phone is not available.
- Switch to a type of cell phone with a hands-free device that will place more distance between the phone and the head of the user.

Hands-free kits reduce the amount of radiofrequency energy exposure to the head because the antenna, which is the source of energy, is not placed against the head.

8. Where can I find more information about radiofrequency energy from my cell phone?

The Federal Communications Commission provides information about the specific absorption rate (SAR) of many recent cell phones. The SAR corresponds to the relative amount of radiofrequency energy absorbed into the head of a cell phone user. Consumers can access this information using the phone's FCC ID number, which is usually located on the case of the phone, and the FCC's ID search form, which is located at http://www.fcc.gov/oet/ea/fccid.

9. What are other sources of radiofrequency energy?

The most common use of radiofrequency energy is for telecommunications. In the United States, cell phones currently operate in a frequency range of about 1,800 to 2,200 megahertz (MHz). In this range, the electromagnetic radiation produced is in the form of non-ionizing radiofrequency energy. Cordless phones (phones that have a base unit connected to the telephone wiring in a house) often operate at radio frequencies similar to those of cell phones; however, since cordless phones have a limited range and require a nearby base, their signals are generally much less powerful than those of cell phones. Among other radiofrequency energy sources, AM/FM radios and VHF/UHF televisions operate at lower radio frequencies than cell phones, whereas sources such as radar, satellite stations, magnetic resonance imaging (MRI) devices, industrial equipment, and microwave ovens operate at somewhat higher radio frequencies.

10. How common is brain cancer? Has the incidence of brain cancer changed over time?

Brain cancer incidence and mortality (death) rates have changed little in the past decade. In the United States, 22,020 new diagnoses and 13,140 deaths from brain cancer were estimated for 2010.

The 5-year survival rate for brain cancers diagnosed from 2001 to 2007 was 33.4 percent. This means that 33.4 out of every 100 persons diagnosed with brain cancer today will survive at least 5 years.

The risk of developing brain cancer increases with age. Between 2000 and 2008, there were fewer than 5 brain cancer cases for every 100,000 people in the United States under age 65, compared with approximately 19 cases for every 100,000 people in the United States who were ages 65 or older.

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Related NCI materials and Web pages:

- *Magnetic Field Exposure and Cancer* Fact Sheet (http://www.cancer.gov/cancertopics/factsheet/Risk/magnetic-fields)
- Cancer Causes and Risk Factors Home Page (http://www.cancer.gov/cancertopics/causes)

How can we help?

We offer comprehensive research-based information for patients and their families, health professionals, cancer researchers, advocates, and the public.

- ***Call*** NCI's Cancer Information Service at 1–800–4–CANCER (1–800–422–6237)
- ***Visit*** us at http://www.cancer.gov or http://www.cancer.gov/espanol
- ***Chat*** using LiveHelp, NCI's instant messaging service, at http://www.cancer.gov/livehelp
- ***E-mail*** us at cancergovstaff@mail.nih.gov
- ***Order*** publications at http://www.cancer.gov/publications or by calling 1–800–4–CANCER
- ***Get help*** with quitting smoking at 1–877–44U–QUIT (1–877–448–7848)

This fact sheet was reviewed on 6/23/11

Cell Phone Facts
Consumer Information on Wireless Phones

Information Provided By: FDA

Information Provided By: FC

- All Q&A's

Wireless Phones
- Description
- Safety
- Interference with Medical Devices
- Research

Radiofrequency Energy
- Description
- Safety
- Research

Base Stations
- Description
- Safety

Safety Standards
- Description
- Standards

About My Phone
- SAR Values for Wireless Phones

Additional Information
- Hearing Aids and Cell Phones
- Other Sources
- Glossary
- Contact Us

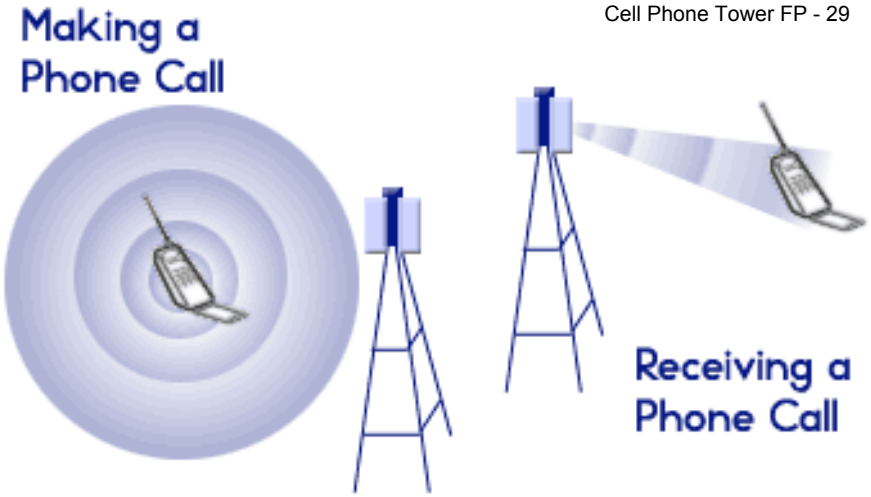
New Information:

In October 2006, the Food and Drug Administration contracted with the National Academy of Sciences (NAS) to conduct a symposium and issue a report on what additional research is needed to address the possible health effects of wireless communication. NAS organized an open workshop of national and international experts to discuss the research conducted to date, knowledge gaps, and additional research needed to fill those gaps in the summer of 2007. Based on the presentations and discussions made at the workshop, NAS has published a report titled "Identification of Research Needs Relating to Potential Biological or Adverse Health Effects of Wireless Communication Devices". An electronic copy of this report can be obtained from the National Academy of Sciences at http://www.nap.edu/catalog.php?record_id=12036 .

Funding for this project came from a Cooperative Research and Development Agreement (CRADA) between the Food and Drug Administration's Center for Devices and Radiological Health and the Cellular Telecommunications and Internet Association (CTIA).

Wireless telephones are hand-held phones with built-in antennas, often called cell, mobile, or PCS phones. These phones are popular with callers because they can be carried easily from place to place.

Wireless telephones are two-way radios. When you talk into a wireless telephone, it picks up your voice and converts the sound to radiofrequency energy (or radio waves). The radio waves travel through the air until they reach a receiver at a nearby base station. The base station then sends your call through the telephone network until it reaches the person you are calling.



When you receive a call on your wireless telephone, the message travels through the telephone network until it reaches a base station close to your wireless phone. Then the base station sends out radio waves that are detected by a receiver in your telephone, where the signals are changed back into the sound of a voice.

The Federal Communications Commission (FCC) and the Food and Drug Administration (FDA) each regulate wireless telephones. FCC ensures that all wireless phones sold in the United States follow safety guidelines that limit radiofrequency (RF) energy. FDA monitors the health effects of wireless telephones. Each agency has the authority to take action if a wireless phone produces hazardous levels of RF energy.

FDA derives its authority to regulate wireless telephones from the Radiation Control provisions of the Federal Food, Drug, and Cosmetic Act (originally enacted as the Radiation Control for Health and Safety Act of 1968). [http://www.fda.gov/cdrh/comp/eprc.html].

FCC derives its authority to regulate wireless telephones from the National Environmental Policy Act of 1969 (NEPA) and the Telecommunications Act of 1996 [http://www.fcc.gov/telecom.html].

Updated June 2, 2008

Independent.co.uk

Germany warns citizens to avoid using Wi-Fi

Environment Ministry's verdict on the health risks from wireless technology puts the British government to shame.

By Geoffrey Lean
Sunday, 9 September 2007

People should avoid using Wi-Fi wherever possible because of the risks it may pose to health, the German government has said.

Its surprise ruling – the most damning made by any government on the fast-growing technology – will shake the industry and British ministers, and vindicates the questions that The Independent on Sunday has been raising over the past four months.

And Germany's official radiation protection body also advises its citizens to use landlines instead of mobile phones, and warns of "electrosmog" from a wide range of other everyday products, from baby monitors to electric blankets.

The German government's ruling – which contrasts sharply with the unquestioning promotion of the technology by British officials – was made in response to a series of questions by Green members of the Bundestag, Germany's parliament.

The Environment Ministry recommended that people should keep their exposure to radiation from Wi-Fi "as low as possible" by choosing "conventional wired connections". It added that it is "actively informing people about possibilities for reducing personal exposure".

Its actions will provide vital support for Sir William Stewart, Britain's official health protection watchdog, who has produced two reports calling for caution in using mobile phones and who has also called for a review of the use of Wi-Fi in schools. His warnings have so far been ignored by ministers and even played down by the Health Protection Agency, which he chairs.

By contrast the agency's German equivalent – the Federal Office for Radiation Protection – is leading the calls for caution.

Florian Emrich, for the office, says Wi-Fi should be avoided "because people receive exposures from many sources and because it is a new technology and all the research into its health effects has not yet been carried out".

Growing Concern about Electromagnetic Pollution and Cell Phones

by Linda Moulton Howe

10 September 2008

Editor's activist alert: by September 29, 2008 the FCC needs to hear your concerns to preserve local control over radiation pollution (time extended past Sept. 15). Details are after the interview in the article below. There are now 1,947,083 microwave towers and antennas in the United States.

Camouflaged microwave tower, Tucson

Like ubiquitous plastics, cell phones (or mobile phones) have come on like gangbusters for their convenience. But the technology was not tested sufficiently, and there was no one to guard the public from predatory industries and knee-jerk consumerist desire for status objects. We are still flooding the environment and our bodies with the abuses of radiation (and plastics), and foisting them on our children. Eleven-year-old kids with cell phones is now common, but the schools and parents aren't bothering to look at the alleged need and how to meet it with a healthy approach. Whenever I use a cell phone or cordless phone I get a pain deep in my ear after a short time of usage. Some people don't get it (pun intended). - *Jan Lundberg*

"Electromagnetic fields generated by cell phones should be considered a potential human health risk."
- Ronald Herberman, M. D., Dir., Univ. of Pittsburgh Cancer Institute

September 5, 2008 Tucson, Arizona - "You cannot see it, taste it or smell it, but it is one of the most pervasive environmental exposures in industrialized countries today. Electromagnetic radiation (EMR) or electromagnetic fields (EMFs) are the terms that broadly describe exposures created by the vast array of wired and wireless technologies that have altered the landscape of our lives in countless beneficial ways. However, these technologies were designed to maximize energy efficiency and convenience - but not with biological effects on people in mind. Based on new studies, there is growing evidence among scientists and the public about possible health risks associated with these technologies."

Those words are from an August 2007 report written by fourteen scientists, public health and public policy experts to document scientific evidence about electromagnetic fields and their impacts on biologies, including human brains and bodies. That 600-page text was entitled, BioInitiative Report:

A Rationale for a Biologically-based Public Exposure Standard for Electromagnetic Fields (ELF and RF). See **BioInitiative Report**.

The scientists' bottom line is disturbing: "What is clear is that the existing public safety standards limiting these radiation levels in nearly every country of the world look to be thousands of times too lenient. Changes are needed." That means everyone is being exposed to too much electromagnetic radiation and at the top of the list are microwaves from microwave cell towers and cell phones.

A year after that BioInitiative report, it provoked Dr. Ronald Herberman, M. D., Director of the University of Pittsburgh Cancer Institute, to issue an unprecedented warning on July 23, 2008, to his faculty and staff entitled, "The Case for Precaution in the Use of Cell Phones." Dr. Herberman's warning began, "Electromagnetic fields generated by cell phones should be considered a potential human health risk. Dr. Herberman lists eleven precautions:

> "1. Do not allow children to use a cell phone except for emergencies. The developing organs of a fetus or child are the most likely to be sensitive to any possible effects of exposure to electromagnetic fields.
>
> Estimation of the penetration of electromagnetic radiation from a cell phone based on age (Frequency GSM 900 Mhz). On the right, a scale showing the Specific Absorption Rate at different depths, in W/kg. Source: Electromagnetic Absorption in the Human Head and Neck for Cell Telephones at 835 and 1900 MHz.
>
> 2. While communicating using your cell phone, try to keep the cell phone away from the body as much as possible. The amplitude of the electromagnetic field is one fourth the strength at a distance of two inches and fifty times lower at three feet.
>
> 3. Whenever possible, use the speaker-phone mode or a wireless Bluetooth headset, which has less than 1/100th of the electromagnetic emission of a normal cell phone. Use of a hands-free ear piece attachment may also reduce exposures.
>
> 4. Avoid using your cell phone in places, like a bus, where you can passively expose others to your phone's electromagnetic fields.
>
> 5. Avoid carrying your cell phone on your body at all times. Do not keep it near your body at night such as under the pillow or on a bedside table, particularly if pregnant. You can also put it on "flight" or "off-line" mode, which stops electromagnetic emissions.
>
> 6. If you must carry your cell phone on you, make sure that the keypad is positioned toward your body and the back is positioned toward the outside so that the transmitted

electromagnetic fields move away from your rather than through you.

7. Only use your cell phone to establish contact or for conversations lasting a few minutes as the biological effects are directly related to the duration of exposure. For longer conversations, use a land line with a corded phone, not a cordless phone, which uses electromagnetic emitting technology similar to that of cell phones.

8. Switch sides regularly while communicating on your cell phone to spread out your exposure. Before putting your cell phone to the ear, wait until your correspondent has picked up. This limits the power of the electromagnetic field emitted near your ear and the duration of your exposure.

9. Avoid using your cell phone when the signal is weak or when moving at high speed, such as in a car or train, as this automatically increases power to a maximum as the phone repeatedly attempts to connect to a new relay antenna.

10. When possible, communicate via text messaging rather than making a call, limiting the duration of exposure and the proximity to the body.

11. Choose a device with the lowest SAR possible (SAR = Specific Absorption Rate, which is a measure of the strength of the magnetic field absorbed by the body). SAR ratings of contemporary phones by different manufacturers are available by searching for “sar ratings cell phones” on the internet.”

Electromagnetic pollution and its impact on human health has been the passionate concern of Libby Kelley, who received a Masters Degree in Public Health Administration from the University of Southern California, and is now Managing Secretariat, International Commission for Electromagnetic Safety (ICEMS), based in Venice, Italy. The International Commission for Electromagnetic Safety is an international group of scientists and medical doctors who do peer reviewed research on electrical and magnetic fields and electromagnetic radiation.

Libby has worked to educate the public about the dangers of electromagnetic pollution since 1996. That was the year only 12 years ago that the Federal Telecommunications Act was passed by Congress and signed by President Bill Clinton into law. Libby learned that a microwave antenna was going to be placed at her child’s pre-school, which was in a church. The telecom company agreed to pay the church $18,000 a year in exchange for using the church’s cupola to place four microwave antennas. What astounded Libby Kelley is no one could answer her questions about what microwave radiation might do to her child and the other children. Libby was also stunned that the new Federal Communications Act specifically prohibited local governments from taking health concerns into account when approving microwave tower sites.

Today as of September 3, 2008, there are now 1,947,083 microwave towers and antennas in the United States. [See: http://www.antennasearch.com/] Also, by 2008, citizen groups are increasingly trying to prevent the addition of more microwave antennas by saying “no” to telecom companies when they want to pay to put antennas in churches, schools or other public buildings. Los Angeles banned cell towers from school property.

Interview:

Libby Kelley, Managing Secretariat,
ICEMS, Tucson, Arizona

Libby Kelley, M. A., Public Health Administration, Managing Secretariat, International Commission for Electromagnetic Safety (ICEMS), Tucson, Arizona: “Once people understand if they can get on top of this quickly, the antenna proposal does not go through. For example, Julie Kornstein, who is a member of the Los Angeles City School District Board, got an ordnance through in 2000 banning cell towers on school property. The fact there is that ordnance in L. A. city schools has gone all over the world and really inspired people.

If you live in Los Angeles and you are driving to work and your kids are playing on school grounds, even if the antenna isn’t on school property, the area where the school is located might have a number of antennas. Increasingly it is becoming harder to find all of them because the industry is often forced to disguise them -- which I prefer not to happen because I want to know where these are so I can avoid them.

When the cell phone company comes calling to a church or school, they typically look for a private school and churches are very easy to work with because they usually need the money.

But in Los Angeles, like everywhere else, the cell phone companies come in a stealth-like manner. They meet with the site owner. They offer something of mutual benefit. They say, ‘We would be happy to help you with this roof, or finance this, or loan money for that and make you a good offer in terms of an annual fee.’ They get a contract with the site owner. Once a contract is signed, the telecom company has the site owner over a barrel because they’ve made a commitment.

And there is a growing understanding that it’s better to say no to these antennas because the science is becoming clearer all the time. The cell tower studies that have been published since 2003 are starting to be very well done and show relationships to health effects. So if it happens in the future that these cell towers are really demonstrated to be causing harm, we might not be able to get the towers down. So, it’s better to not let them go up in the first place. It’s just not worth it.

There is a lot more networking going on in this country among citizens, among public health advocates, scientists and medical doctors. I see the tipping point on this issue coming now. It’s just

that I don't know how quickly we can move given the forces. This is a one trillion dollar business globally, telecommunications."

The telecommunications industry is trying to stop all citizen influence on restricting cell tower sites. On July 11, 2008, the Cellular Telephone Industries Association (CTIA), petitioned the FCC to declare new limitations on local zoning authority as it affects cell tower siting. A deadline for public comments was set as September 15, 2008, by the FCC and **click here for Public Notice for Comments**.

Specifically, CTIA requests the Federal Communications Commission to:

1. Force municipalities to act on wireless antenna or tower zoning applications within 45 or 75 days.

2. Rule that applications are automatically "deemed granted" if a local government misses the FCC's deadline.

3. Prevent municipalities from considering the presence of service by other carriers in evaluating an additional carrier's application for an antenna site.

4. Pre-empt any local ordinance that would automatically require a variance for cell tower applications.

"LIBBY, THIS MEANS THAT THE FCC, UNDER PRESSURE OF CTIA, IS CONSIDERING TAKING THE TAX-PAYING PUBLIC OUT OF THE LOOP ON DECISIONS FOR THE PLACEMENT OF MICROWAVE TOWERS?

That is exactly what is happening. How many towers do we need in this country or on the planet?! This industry intends to create a planetary network of microwave antennas that are inter-operable so we can all communicate, but our health is at stake. The planet's health is at stake. So, I really think we need to slow this down and the scientists I'm working with are calling for the development of biologically-based standards to take into account the science that shows what happens to living organisms – not just people – far below the existing electromagnetic radiation standards set by the FCC and other nations of the world.

IF THERE ARE NEARLY TWO MILLION MICROWAVE ANTENNAS NOW IN THE UNITED STATES AND HUNDREDS OF THOUSANDS MORE IN OTHER NATIONS OF THE WORLD, HOW DO YOU PUT THE ELECTROMAGNETIC POLLUTION GENIE BACK IN THE BOTTLE?

That's the question that people really can't answer. Nobody wants to be a simple-minded Luddite and just say, 'Turn it off. Let's go back to a former time and pretend that none of this really happened.'

[Editor's Note: Wikipedia - The Luddites were an 1811 social movement of British textile artisans who protested—often by destroying mechanized looms—against the changes produced by the Industrial Revolution, which they felt threatened their livelihood.]

Technology always works this way. It happens and then the questions about efficacy and safety and health always come later. We're so in love with innovation. So, we're all owning this now. I tell people who call me concerned about an antenna, 'If you are using a cellular phone. If you own cordless phones in your home and microwave ovens, you are a consumer and you are supporting this microwave build-out.' So people really need to take their consumer behavior into account.

We've reached a point in most urban areas of the United States where we have an electromagnetic smog condition and people who have immune problems such as electrical hypersensitivity are leaving those places. They can't live there. They can't work there. Something has got to change."

Film available: Public Exposure: DNA, Democracy and the Wireless Revolution.

Lawsuit says cell towers kill millions of birds

By Paul Davidson, USA TODAY

The USA's expanding network of cell phone towers, aimed at improving service for millions of consumers, is unintentionally killing a growing number of birds, including endangered species, experts say.

Now the issue is in the courts.

Environmental groups recently sued the Federal Communications Commission, saying it illegally approves towers that serve as death traps for millions of migratory birds.

The groups say the commission has ignored their pleas to study the impact of the towers on birds. "The FCC has known about this for several years," says Ron Shems, lawyer for the Forest Conservation Council, the American Bird Conservancy and Friends of the Earth.

FCC officials say they cannot comment on the lawsuit, filed in a federal appeals court in Washington, D.C. But the birds appear to be caught in a bureaucratic standoff.

FCC officials say they have examined the problem but have neither the expertise nor funding to complete the studies the groups seek. The U.S. Fish and Wildlife Service is better suited to the task, they say.

Fish and Wildlife official Paul Schmidt says his agency has done basic studies showing that "towers kill birds." But he and the environmental groups say it's the FCC's legal obligation to complete more detailed reports to identify remedies. Different tower designs could then be required for new towers.

Citing Fish and Wildlife statistics, the lawsuit claims that 4 million to 60 million birds die each year when they crash into the USA's 60,000 towers that are at least 200 feet high. Most are cell phone towers, but some also serve TV, radio or paging networks.

The lawsuit focuses on the 5,800 towers built since 1996 on the Gulf Coast, a 100-mile swath from Port Isabel, Texas, to Tampa. Large flocks of birds stop in that region's forests and wetlands before and after flights across the Gulf of Mexico, the environmentalists say. Sapped by their journey and disoriented by nighttime fog, the birds are drawn by the towers' lights, the lawsuit says. Warblers, vireos and woodpeckers are among the victims, some of which are endangered or at risk of becoming so.

The FCC, the groups say, does cursory reviews of the environmental impact of proposed towers, but the reviews don't examine the towers' effects on birds. They say that violates the National Environmental Policy Act, the Endangered Species Act and the Migratory Bird Treaty Act.

Bird deaths can be mitigated by keeping towers under 200 feet, minimizing light and wire, and

avoiding wetlands and flood plains, Fish and Wildlife guidelines say.

But Betsy Stephenson of the Personal Communications Industry Association, which represents tower companies, says the wires provide "safety and support," and the lights comply with federal aviation rules. Tower locations and heights are aimed at providing adequate cell phone coverage.

Research suggesting that towers kill birds "is unscientific and anecdotal," she says. "We'd like to see unbiased scientific research funded by the government."

Strike back at lightning

By Vicki W. Kipp

Site Management & Technology, Sep 1, 2002

While humans have 1 in 6,000 odds of being struck by lightning, towers have 1 in 1 odds of being struck. It's basically inevitable.

How lightning works

When the equilibrium of electrical charges between the atmosphere and the earth becomes unbalanced, nature uses lightning to restore the balance.

The atmosphere is composed of atoms. Warm air moving upward and atmospheric turbulence from storms cause atoms to dissociate into separate groups of charged ions. Negatively charged ions accumulate at the base of the clouds in the lower atmosphere while positively charged ions ascend to the upper atmosphere (Figure 1). Normally, the surface of the earth has a negative charge.

However, when negative charges build up in the lower atmosphere, they repel the negative charges on the surface of the earth.

Consequently, the earth takes on a large positive charge.

Since opposite charges attract, the negative ions in the lower atmosphere are now attracted to the positive surface of the earth. Negative ions are very light so they can move towards positive charges with speed and ease. The negative charges move swiftly toward the earth, creating a phenomenon known as lightning. As the negative ions head toward the ground, positive ions on the surface of the earth are drawn upward slowly. Initially, the ions flow slowly because air is a poor conductor. However, the attraction between the negative and positive ions becomes so great that they overcome the resistance of the air.

When negative ions move down through the air, their flow is called a ‘step leader’ or ‘pilot streamer’ because of the erratic path that electrons take as they seek the earth. The negative ions flow downward until the resistance of the air becomes too great, and then they travel horizontally, followed by further downward movement.

Finally, the downward moving negative ions are met by the upward moving positive ions. When negative and positive ions connect, a conductive path from the cloud to the ground is formed (Figure 2). Negative ions hurry down the path creating an observable stroke. New negative ions flow into the void left by the discharge of negative ions. These new negative ions rush along the path.

Additional negative ions come from neighboring clouds. Negative ions continue to flow until equilibrium returns between the atmosphere and earth.

There is a long-standing argument about whether lightning strikes up or down. Although the negative charges are moving downward, it is the fast-moving charges that create the light. Hence the visible lightning stroke in fact moves upward.

Lightning seeks towers

Observing an NTSC antenna from the Candelabra as it lay on the ground during tower work, I noticed that the antenna grounding rods were covered with sizzle marks where they had been branded by the tips of lightning bolts. According to Winton Wilcox of ComTrain, “Towers are struck by lightning more than any other man-made structure.” Towers are frequent targets for lightning because they are so high above ground level. For an optimum coverage area, broadcast towers are intentionally designed to be taller than neighboring buildings.

Besides the height factor, towers attract lightning because they are built of conductive steel. Positive ions from the earth can travel up a steel tower much easier than they could travel up through air alone. The highest point at the top of the tower is where the positive charges will accumulate.

Lightning damage

When lightning strikes a tower, various types of damage can occur. Under certain circumstances, a lightning strike could lead to collapse of the tower structure. Lightning can melt the insulation on the guy wires or cause cracks in the concrete guy anchor. Transmission lines and voltage sensitive devices can be damaged by large peak voltages from lightning. Electrical current from lightning can generate heat and transfer energy.

Guyed towers can tolerate lightning better than self-supporting towers because guyed towers deflect the lightning charge down the guy wires to the ground. Assuming that the guy anchors are grounded properly, a great deal of energy is dissipated into the ground away from the base of the tower.

For proper grounding, grounding components should be attached to the guy wires above the preforms, turnbuckles, and anchor heads.

Minimizing damage

Grounding allows some control of where energy will go when lightning strikes a tower. Experts remind us that grounding is meant to be a lightning protection system, not a lightning prevention system. Grounding involves applying a system to allow an electrical surge to pass through a conductor rather than lingering at and causing damage to the conductor.

Grounding also shields tower structures, such as a fence or site building, from the antenna's radiation pattern. This prevents the tower accessories from absorbing and then re-transmitting RF, causing a skewed signal pattern.

Believe it or not, there are some people who are opposed to grounding systems. They argue that installing a grounding system provides a path to the top of the tower for positive charges to climb. The anti-grounding faction feels that grounding almost guarantees that the tower will be struck by lightning.

Grounding advocates point out that if a tower is struck by lightning and a grounding path has not been provided, the tower will be subjected to the excess charges. They claim that it is easier and more cost-effective to build lightning protection and grounding into a tower site than to repair lightning damage.

Grounding system

A successful lightning grounding system needs to rapidly disperse large quantities of electrons from a strike over a broad area. A tower grounding system must meet the specifications set in the 1996 TIA/EIA-RS-222-F standard. To be effective, the grounding system requires a low impedance path to earth, and a low resistance interface with earth ground.

A tower grounding system (Figure 3) usually includes a lightning rod or lightning dissipater, secondary ground, primary ground, and ground rods.

Lightning rod

A lightning rod, or collector, is placed at the top of a tower to extend at least two feet above all other tower hardware. The purpose of the lightning rod is to receive a strike and pass it through to the next element of the grounding system. The rod is usually made of copper clad steel.

Lightning dissipator

An alternative to placing a lightning collector on top of the tower is to place a lightning dissipater on top. A dissipater acts as a shield by reducing the potential between the tower and a storm cloud. Performing controlled leakage of the positive charge, it transfers the positive electrical charge to nearby ionizing air molecules. In theory, this action reduces the likelihood of a strike.

If the electric charge accumulation rate at the top of the tower significantly exceeds the dissipation rate and lightning strikes, the dissipater will redirect the lightning away from equipment toward a safe, planned path to earth.

Secondary ground

A conducting connection should be run between any tower appurtenance such as an antenna, bracket, or platform and the tower. For transmission line, a grounding connection should be made at the top of the tower, bottom of the tower, at the entry port to the building, and at every 200 feet of run.

This connection is called the secondary ground. The secondary ground provides a low resistance path to ground. It discharges static charges, lightning, or other electrical phenomena away from the tower structure. The term “down lead” is often used to describe the wire that runs between tower attachments and the primary ground. Copper wire is often used for the secondary ground.

Unfortunately, rain can cause a reaction between the copper strap and the steel tower that leaches away the copper.

Primary ground

The primary ground is the link between the tower and the earth or a conducting element used in place of earth ground.

Grounding straps (Figure 4) run as radials between the tower structure and the ground halo.

Flat wire is more effective than round wire for grounding straps since it has greater surface area.

Bus bar

A bus bar is a piece of highly conductive copper or copper-clad steel that collects energy from numerous sources and conducts it down a common path to ground. With dimensions of ¾ inch thick, 4 inches wide, and 18 inches long, a bus bar is connected to the ground with a ground strap.

A bus bar should be mounted to the exterior of the building where transmission lines enter the building and to the interior of the building just below the entry ports. The exterior bus bar is insulated from the building and grounded to the ground halo. Transmission lines are grounded to the exterior bus bar.

The bus bar that is mounted inside the building is called a ground window. The repeater equipment; entry hatches for transmission line (if they are a conductive material); door frames, window frames, ventilation louvers, and any other sheet metal surfaces; cable trays; AC power line and breaker panel box; telephone lines, blocks and related parts; any peripheral conductive item within 6 feet of any other conductive surface; metal battery racks; utility conduit and pipes; transmitter combiner; receive multicoupler; and any surge suppressor equipment should all be grounded to the common collection point of the ground window.

Ground halo

The purpose of a ground halo is to allow single point grounding. Single point grounding directs all charges down one path to one exit point. A ground halo is often built around a site building and is also built below ground to connect the ground rods. The underground ground halo connects to and transfers energy to all of the ground rods.

Foundation grounding

Controversy surrounds the premise that reinforcing bar in the foundation of site buildings should be grounded. Some argue that rebar is insulated inside the concrete, and does not need to be grounded. The debate centers on the conductivity of concrete.

Under normal circumstances, concrete is not conductive.

However, when the ground is wet and lightning strikes, rebar that is close to the surface could collect energy. There is a risk that the energy passing through concrete could turn the water portion of the concrete into steam, cracking the concrete.

Ufer grounding, named after the engineer who originated the concept, can protect against this risk. With Ufer grounding, the rebar is grounded inside the concrete block, and a ground strap is run along the underside of the foundation to a ground rod. Charges in the concrete are dissipated down into the earth.

Ground rods

Ground rods are conductive metal poles placed in the ground for the purpose of dissipating electric charges to the soil. They are made of steel and coated in a stainless cover of copper cladding or galvanized coating. The coating on the rod prevents rust. This is important since rust is a poor conductor of electrical charges.

A typical ground rod has a diameter of one-half inch to one inch, and length of eight to ten feet. Most ground systems contain at least four ground rods.

The successfulness of a ground system is influenced by the depth of the ground rods, conductivity and resistivity of the soil, and distance between the rods. Ground rods are inserted horizontally underground at a depth of at least two to six feet below ground level. Moist clay bearing soil is desirable for setting up a grounding system. The conductivity of the soil can be improved with soil treatment techniques such as electrolyte fill.

Installation of ground rods requires that the rods be driven into the ground forcefully instead of placing the rods in pre-drilled holes. Pressure must be used when inserting the rods so that the soil will be compacted to form a connection with the surface of the rod.

When ground rods are installed, the correct distance between the rods must be determined for proper placement. Traditionally, the minimum separation between rods should be greater than the sum of the lengths of two adjacent rods. The “sphere of influence” (Figure 5) of a rod is the amount of soil used in dissipating the charge from one rod. The area of the “sphere of influence” has a radius and depth equivalent to the length of the rod.

For example, the sphere of influence of a 10-foot ground rod would have a diameter of 20 feet around the rod and would be 10 feet deep.

It is essential to determine the correct separation distance between rods. When rods discharge they will saturate the soil in their immediate area. Inefficiency will result if a rod tries to dissipate charge in soil already saturated by another rod.

If the charge being dissipated by a ground rod is too great for the soil to absorb, the rod could actually fuse into glass. A glass ground rod makes a great insulator, and a poor conductor of charges.

Conclusion

Humans face a relatively slim risk of being struck by lightning. If such misfortune should occur, there is a lightning strike survivors support group that they can join. Towers have an extremely high risk of being struck by lightning.

There isn't a support group for towers, but there is a multitude of grounding hardware available to make a lightning strike less harmful.

The New York Times
nytimes.com

June 3, 2008

Well

Experts Revive Debate Over Cellphones and Cancer

By TARA PARKER-POPE

What do brain surgeons know about cellphone safety that the rest of us don't?

Last week, three prominent neurosurgeons told the CNN interviewer Larry King that they did not hold cellphones next to their ears. "I think the safe practice," said Dr. Keith Black, a surgeon at Cedars-Sinai Medical Center in Los Angeles, "is to use an earpiece so you keep the microwave antenna away from your brain."

Dr. Vini Khurana, an associate professor of neurosurgery at the Australian National University who is an outspoken critic of cellphones, said: "I use it on the speaker-phone mode. I do not hold it to my ear." And CNN's chief medical correspondent, Dr. Sanjay Gupta, a neurosurgeon at Emory University Hospital, said that like Dr. Black he used an earpiece.

Along with Senator Edward M. Kennedy's recent diagnosis of a glioma, a type of tumor that critics have long associated with cellphone use, the doctors' remarks have helped reignite a long-simmering debate about cellphones and cancer.

That supposed link has been largely dismissed by many experts, including the American Cancer

Society. The theory that cellphones cause brain tumors "defies credulity," said Dr. Eugene Flamm, chairman of neurosurgery at Montefiore Medical Center.

According to the Food and Drug Administration, three large epidemiology studies since 2000 have shown no harmful effects. CTIA the Wireless Association, the leading industry trade group, said in a statement, "The overwhelming majority of studies that have been published in scientific journals around the globe show that wireless phones do not pose a health risk."

The F.D.A. notes, however, that the average period of phone use in the studies it cites was about three years, so the research doesn't answer questions about long-term exposures. Critics say many studies are flawed for that reason, and also because they do not distinguish between casual and heavy use.

Cellphones emit non-ionizing radiation, waves of energy that are too weak to break chemical bonds or to set off the DNA damage known to cause cancer. There is no known biological mechanism to explain how non-ionizing radiation might lead to cancer.

But researchers who have raised concerns say that just because science can't explain the mechanism doesn't mean one doesn't exist. Concerns have focused on the heat generated by cellphones and the fact that the radio frequencies are absorbed mostly by the head and neck. In recent studies that suggest a risk, the tumors tend to occur on the same side of the head where the patient typically holds the phone.

Like most research on the subject, the studies are observational, showing only an association

between cellphone use and cancer, not a causal relationship. The most important of these studies is called Interphone, a vast research effort in 13 countries, including Canada, Israel and several in Europe.

Some of the research suggests a link between cellphone use and three types of tumors: glioma; cancer of the parotid, a salivary gland near the ear; and acoustic neuroma, a tumor that essentially occurs where the ear meets the brain. All these cancers are rare, so even if cellphone use does increase risk, the risk is still very low.

Last year, The American Journal of Epidemiology published data from Israel finding a 58 percent higher risk of parotid gland tumors among heavy cellphone users. Also last year, a Swedish analysis of 16 studies in the journal Occupational and Environmental Medicine showed a doubling of risk for acoustic neuroma and glioma after 10 years of heavy cellphone use.

“What we’re seeing is suggestions in epidemiological studies that have looked at people using phones for 10 or more years,” says Louis Slesin, editor of Microwave News, an industry publication that tracks the research. “There are some very disconcerting findings that suggest a problem, although it’s much too early to reach a conclusive view.”

Some doctors say the real concern is not older cellphone users, who began using phones as adults, but children who are beginning to use phones today and face a lifetime of exposure.

“More and more kids are using cellphones,” said Dr. Paul J. Rosch, clinical professor of medicine and psychiatry at New York Medical College. “They may be much more affected. Their brains are

growing rapidly, and their skulls are thinner.”

For people who are concerned about any possible risk, a simple solution is to use a headset. Of course, that option isn’t always convenient, and some critics have raised worries about wireless devices like the Bluetooth that essentially place a transmitter in the ear.

The fear is that even if the individual risk of using a cellphone is low, with three billion users worldwide, even a minuscule risk would translate into a major public health concern.

“We cannot say with any certainty that cellphones are either safe or not safe,” Dr. Black said on CNN. “My concern is that with the widespread use of cellphones, the worst scenario would be that we get the definitive study 10 years from now, and we find out there is a correlation.”

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EWG Science Review

Cell Phone Radiation Damages Sperm, Studies Show

Phones Carried on Belt or in Pants Pocket May Harm Reproductive Health

Although most scientific and public attention on the issue of the safety of cell phone radiation has focused on evidence suggesting an increased risk of brain tumors (Baan 2011), a little-noticed but growing body of research points to a new concern – sperm damage (La Vignera 2012).

In a comprehensive review of the published scientific literature, the Environmental Working Group found 10 human studies that have identified a startling variety of changes in sperm exposed to cell phone radiation. In the most striking findings, men who carried their phones in a pocket or on the belt were more likely to have lower sperm counts and/or more inactive or less mobile sperm. These findings accord with similar results in laboratory animals.

Collectively, the research indicates that exposure to cell phone radiation may lead to decreases in sperm count, sperm motility and vitality, as well as increases in indicators of sperm damage such as higher levels of reactive

oxygen species (chemically reactive molecules containing oxygen), oxidative stress, DNA damage and changes in sperm morphology (see summary below).

Many men who talk on a cell phone using a Bluetooth device or other headset keep the phone in a pants pocket or clipped to a holster. This exposes their reproductive organs to cell phone radiation, and several studies have found lower sperm count and/or poorer sperm quality in men who use their phones this way than in those who do not.

Scientists have yet to identify a mechanism by which cell phone use might cause such effects (Makker 2009). However, the research appears to rule out the possibility that the changes are caused by simple heating, which is considered to be a possible source of some radiofrequency radiation-related health problems (De Iuliis 2009; Volkow 2011).

The findings are particularly significant in light of the fact that infertility affects approximately 15 percent of couples of reproductive age, and nearly half of these cases are linked to male fertility (Sharlip 2002). The number and consistency of the findings raise the possibility that cell phone radiation could be contributing to this significant public health problem and demand further investigation.

Studies linking cell phone exposure to harmful effects on sperm have been done in the United States, Australia, Austria, Hungary, Poland, Turkey and South Africa, using diverse methodologies. In some, scientists compared sperm counts and sperm health in men who wore cell phones on the hip with those who carried them elsewhere on the body or did not use cell phones at all. In others, researchers exposed sperm to cell phone radiation under laboratory conditions. In still others, scientists examined whether there was a correlation between sperm health and the intensity of cell phone use among men undergoing evaluation for infertility.

Among the findings:

- Men who carried a phone in a hip pocket or on the belt had 11 percent fewer mobile sperm than men who kept a phone elsewhere on the body (Kilgallon 2005).
- Men who carried a cell phone on the belt and used it intensively during a five-day test period had a 19 percent drop in highly motile sperm from their previous levels (Davoudi 2002).
- Men who talked on the phone for more than an hour a day had 17 percent fewer highly motile sperm than men who talked less than 15 minutes a day (Fejes 2005).

Laboratory studies on the effects of cell phone radiation on rats, rabbits and other animals have found similar effects on reproductive health (Kesari 2011; Mailankot 2009).

All these studies found statistically significant correlations between cell phone radiation and sperm health, and many found that the adverse changes increased with the amount of radiation exposure. Opinions differ as to the possible mechanism by which cell phone radiation might produce these changes (Falzone 2010).

A number of research papers include unambiguous statements on the potential of cell phone radiation to affect men's reproductive health:

- *"Keeping the cell phone in a trouser pocket in talk mode may negatively affect spermatozoa and impair male fertility" (Agarwal 2009).*
- *"Use of cell phones decreases the semen quality in men by decreasing the sperm count, motility, viability and normal morphology. The decrease in sperm parameters was dependent on the duration of daily exposure to cell phones and independent of the initial semen quality" (Agarwal 2008).*
- *"These findings have clear implications for the safety of extensive mobile phone use by males of reproductive age, potentially affecting both their fertility and the health and wellbeing of their offspring" (De Iuliis 2009).*
- *"Overall, these findings raise a number of related health policy and patient management issues that deserve our immediate attention. Specifically, we recommend that men of reproductive age who engage in high levels of mobile phone use do not keep their phones in receiving mode below waist level" (De Iuliis 2009).*
- *"Our results showed that cell phone use negatively affects sperm quality in men… Men with poor sperm quality planning for pregnancy should be advised not to use cell phones extensively" (Gutschi 2011).*
- *"The results show that human spermatozoa exposed to RF-EMR have decreased motility, morphometric abnormalities and increased oxidative stress, whereas men using mobile phones have decreased sperm concentration, motility…, normal morphology, and viability. These abnormalities seem to be directly related with the length of mobile phone use" (La Vignera 2012).*

Given the backdrop of increasing infertility rates (Swan 2006), the research findings should be a wake-up call to male cell phone users who are trying to have children or may want to in the future.

Even as scientists continue to gather new data on health risks from cell phone radiation, the findings underscore that consumers should practice simple, precautionary safe-cell-phone-use habits, such as keeping the phone away from the body, in order to protect their health and fertility. Men, in particular, should avoid carrying a cell phone on the belt or in a pants pocket when in use.

What About Women's Health?

There are no published studies examining the effect of cell phone radiation on reproductive health in women. Such studies are much more difficult to carry out, since they often require invasive techniques. However, several recent articles suggested that cell phone radiation might be harmful to the developing fetus. For example, a 2009 study in Turkey found that after pregnant rats were exposed to cell phone radiation for 15 minutes twice a day during the entire gestation period, their female pups had fewer ovarian follicles (Gul 2009). A 2012 study by researchers at the Yale University School of Medicine found that mice exposed to cell phone radiation during gestation were hyperactive and had impaired memory (Aldad 2012).

There have been similar findings in two human studies. UCLA researchers reported that cell phone exposure during pregnancy and after birth was associated with behavioral problems in young children (Divan 2008; Divan 2012). This line of research is just beginning, but a recent review article emphasized that cell phone radiation might impact reproduction and development *in both men and women* (Merhi 2011).

Table: Peer-reviewed studies of the effects of cell phone radiation on male reproduction

Reference	Study design	Finding	Type of exposure
Davoudi M, Brossner C, Kuber W. 2002. The influence of electromagnetic waves on sperm motility. Journal für Urologie und Urogynäkologie 19: 19-22.	Semen analysis for 13 male volunteers who carried a cell phone on the belt and actively used it for 5 days.	Compared to a period of cell phone use on the belt by the same volunteers, cell phone use was associated with decreased sperm motility. The percentage of highly motile sperm (classified as "rapid progressive sperm") dropped from a mean of 32% to a mean of 26% after the exposure.	GSM phone; study participants used phones for at least 6 hours/day.
Fejes I, Zavaczki Z, Szollosi J, Koloszar S, Daru J, Kovacs L, et al. 2005. Is there a relationship between cell phone use and semen quality? Arch Androl 51(5): 385-93.	Semen analysis for 371 men who attended an infertility clinic in 2002-2004.	Low-volume cell phone users (less than 15 minutes a day) had a higher percentage of rapid progressive motile sperm (48.7%) than high-volume (more than one hour a day) cell phone users (40.6%).	Pattern of use identified by a questionnaire, including duration of phone possession and frequency of daily use.
Kilgallon SJ, Simmons LW. 2005. Image content influences men's semen quality. Biol Lett 1(3): 253-5.	Analysis of sperm samples from 52 healthy men aged 18-35.	Men who carried a cell phone in a hip pocket or on the belt had lower sperm motility (49.3% motile sperm) than men who did not use a cell phone near the hip (55.4% motile sperm).	Questionnaire responses identified men who carried a cell phone in a hip pocket or on the belt, non-users and those who kept a phone elsewhere.
Erogul O, Oztas E, Yildirim I, Kir T, Aydur E, Komesli G, et al. 2006. Effects of electromagnetic radiation from a cellular phone on human sperm motility: an in vitro study. Arch Med Res 37 (7): 840-3.	Semen samples collected from 27 men exposed to cell phone radiation under laboratory conditions.	Exposed specimens had a decrease in rapid progressive sperm from 13% to 9%; a decrease in slow progressive sperm from 44% to 34% and an increase in immotile sperm from 36% to 51%.	Test specimens were exposed for 5 minutes to GSM cell phone radiation at 900 MHz.

Wdowiak A, Wdowiak L, Wiktor H. 2007. Evaluation of the effect of using mobile phones on male fertility. Ann Agric Environ Med 14 (1): 169-72.	Sperm parameters examined in a group of 304 males enrolled at an infertility clinic in 2004-2006.	16.7% of regular cell phone users had normal semen morphology, compared to 55.6% of non-users. In 35% of frequent cell phone users, sperm motility dropped by up to a half; only 9% of non-users had comparable decreases in sperm motility.	Based on questionnaire responses, 99 participants were classified as cell phone non-users; 157 had used GSM phones sporadically for 1-2 years; and 48 had used cell phones regularly for more than 2 years.
Agarwal A, Deepinder F, Sharma RK, Ranga G, Li J. 2008. Effect of cell phone usage on semen analysis in men attending infertility clinic: an observational study. Fertil Steril 89(1): 124-8.	Sperm parameters examined in 361 men undergoing infertility evaluation in 2004-2005	Patients who used cell phones more than 4 hours a day had a 42% lower sperm count and 33% lower sperm motility than non-users. The percentage of sperm with normal morphology in high-level users was half that of non-users. Rates of normal morphology were decreased with greater levels of cell phone use.	Based on questionnaire responses, cell phone exposure was classified in four groups: no use; less than 2 hours/day; 2-4 hours/day; and more than 4 hours/day.
Agarwal A, Desai NR, Makker K, Varghese A, Mouradi R, Sabanegh E, et al. 2009. Effects of radiofrequency electromagnetic waves (RF-EMW) from cellular phones on human ejaculated semen: an in vitro pilot study. Fertil Steril 92(4): 1318-25.	Semen samples collected from 23 normal healthy donors and 9 infertile patients were exposed to cell phone radiation under laboratory conditions.	Semen samples exposed to cell phone radiation showed a significant drop in sperm motility (52% to 49%) and viability (59% to 52%); nearly doubled production of reactive oxygen species levels; and a decrease in total antioxidant capacity, a measure of oxidative stress.	Samples exposed for 1 hour to radiation from GSM cell phone in talk mode at 850 MHz frequency.

De Iuliis GN, Newey RJ, King BV, Aitken RJ. 2009. Mobile phone radiation induces reactive oxygen species production and DNA damage in human spermatozoa in vitro. PLoS One 4(7): e6446.	Purified human sperm from 22 healthy donors were exposed to cell phone radiation under laboratory conditions.	Exposed sperm samples showed lower sperm motility and vitality, production of reactive oxygen species and DNA fragmentation. At SAR of 1.0 W/kg sperm, motility decreased from 86% in unexposed sperm to 68%; vitality decreased from 89% to 65%.	Samples were exposed to 1800 MHz radiation at a range of SAR values from 0.4 W/kg to 27.5 W/kg for 16 hours, at a constant temperature of 210C to rule out thermal effects.
Falzone N, Huyser C, Becker P, Leszczynski D, Franken DR. 2011. The effect of pulsed 900-MHz GSM mobile phone radiation on the acrosome reaction, head morphometry and zona binding of human spermatozoa. Int J Androl 34(1): 20-6.	Purified human sperm collected from 12 healthy volunteers were exposed to cell phone radiation under laboratory conditions.	Cell phone radiation exposure appeared to affect sperm's fertilization potential. Exposed sperm's head area dropped by 50%. Sperm-oocyte interaction was decreased by 28% compared to unexposed controls.	Samples were exposed for 1 hour to 900 MHz GSM mobile phone radiation at SAR of 2.0 W/kg.
Gutschi T, Mohamad Al-Ali B, Shamloul R, Pummer K, Trummer H. 2011. Impact of cell phone use on men's semen parameters. Andrologia: 43(5): 312-6.	Analysis of semen samples from 2,100 men seen at an infertility clinic in 1993-2007.	68% of the sperm from cell phone users had pathological morphology, compared to 58% of sperm from non-users. Abnormal sperm morphology diagnosed in 45% of cell phone users versus 27.7% of non-users.	Retrospective study compared 991 cell phone users and 1,119 non-users identified via questionnaire responses.

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SECTION 1

SUMMARY FOR THE PUBLIC

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These proposals reflect the evidence that a positive assertion of safety with respect to chronic exposure to low-intensity levels of ELF and RF cannot be made. As with many other standards for environmental exposures, these proposed limits may not be totally protective, but more stringent standards are not realistic at the present time. Even a small increased risk for cancer and neurodegenerative diseases translates into an enormous public health consequence. Regulatory action for ELF and preventative actions for RF are warranted at this time to reduce exposures and inform the public of the potential for increased risk; at what levels of chronic exposure these risks may be present; and what measures may be taken to reduce risks.

C. Problems with Existing Public Health Standards (Safety Limits)

Today's public exposure limits for telecommunications are based on the presumption that heating of tissue (for RF) or induced electric currents in the body (for ELF) are the only concerns when living organisms are exposed to RF. These exposures can create tissue heating that is well known to be harmful in even very short-term doses. As such, thermal limits do serve a purpose. For example, for people whose occupations require them to work around radar facilities or RF heat-sealers, or for people who install and service wireless antenna tower, thermally-based limits are necessary to prevent damage from heating (or, in the case of power-frequency ELF from induced current flow in tissues). In the past, scientists and engineers developed exposure standards for electromagnetic radiation based what we now believe are faulty assumptions that the right way to measure how much non-ionizing energy humans can tolerate (how much exposure) without harm is to measure only the heating of tissue (RF) or induced currents in the body (ELF).

In the last few decades, it has been established beyond any reasonable doubt that bioeffects and some adverse health effects occur at far lower levels of RF and ELF exposure where no heating (or induced currents) occurs at all; some effects are shown to occur at several hundred thousand times below the existing public safety limits where heating is an impossibility.

It appears it is the INFORMATION conveyed by electromagnetic radiation (rather than heat) that causes biological changes - some of these biological changes may lead to loss of wellbeing, disease and even death.

Effects occur at non-thermal or low-intensity exposure levels thousands of times below the levels that federal agencies say should keep the public safe. For many new devices operating with wireless technologies, the devices are exempt from any regulatory standards. The existing standards have been proven to be inadequate to control against harm from low-intensity, chronic exposures, based on any reasonable, independent assessment of the scientific literature. It means that an entirely new basis (a biological basis) for new exposure standards is needed. New standards need to take into account what we have learned about the effects of ELF and RF (all non-ionizing electromagnetic radiation and to design new limits based on biologically-demonstrated effects that are important to proper biological function in living organisms. It is vital to do so because the explosion of new sources has created unprecedented levels of artificial

electromagnetic fields that now cover all but remote areas of the habitable space on earth. Mid-course corrections are needed in the way we accept, test and deploy new technologies that expose us to ELF and RF in order to avert public health problems of a global nature.

Recent opinions by experts have documented deficiencies in current exposure standards. There is widespread discussion that thermal limits are outdated, and that biologically-based exposure standards are needed. Section 4 describes concerns expressed by WHO, 2007 in its ELF Health Criteria Monograph; the SCENIHR Report, 2006 prepared for the European Commission; the UK SAGE Report, 2007; the Health Protection Agency, United Kingdom in 2005; the NATO Advanced Research Workshop in 2005; the US Radiofrequency Interagency Working Group in 1999; the US Food and Drug Administration in 2000 and 2007; the World Health Organization in 2002; the International Agency for Cancer Research (IARC, 2001), the United Kingdom Parliament Independent Expert Group Report on Mobile Phones – Stewart Report, 2000) and others.

A pioneer researcher, the late Dr. Ross Adey, in his last publication in Bioelectromagnetic Medicine (P. Roche and M. Markov, eds. 2004) concluded:

> "*There are major unanswered questions about possible health risks that may arise from exposures to various man-made electromagnetic fields where these human exposures are intermittent, recurrent, and may extend over a significant portion of the lifetime of the individual."*
>
> *"Epidemiological studies have evaluated ELF and radiofrequency fields as possible risk factors for human health, with historical evidence relating rising risks of such factors as progressive rural electrification, and more recently, to methods of electrical power distribution and utilization in commercial buildings. Appropriate models describing these bioeffects are based in nonequilibrium thermodynamics, with nonlinear electrodynamics as an integral feature. Heating models, based in equilibrium thermodynamics, fail to explain an impressive new frontier of much greater significance. ..... Though incompletely understood, tissue free radical interactions with magnetic fields may extend to zero field levels." (2)*

There may be no lower limit at which exposures do not affect us. Until we know if there is a lower limit below which bioeffects and adverse health impacts do not occur, it is unwise from a public health perspective to continue "business-as-usual" deploying new technologies that increase ELF and RF exposures, particularly involuntary exposures.

II. SUMMARY OF THE SCIENCE

A. Evidence for Cancer

1. Childhood Leukemia

The evidence that power lines and other sources of ELF are consistently associated with higher rates of childhood leukemia has resulted in the International Agency for Cancer Research (an arm of the World Health Organization) to classify ELF as a Possible Human Carcinogen (in the Group 2B carcinogen list). Leukemia is the most common type of cancer in children.

There is little doubt that exposure to ELF causes childhood leukemia.

The exposure levels for increased risk are quite low – just above background or ambient levels and much lower than current exposure limits. The existing ICNIRP limit is 1000 mG (904 mG in the US) for ELF. Increased risk for childhood leukemia starts at levels almost one thousand times below the safety standard. Leukemia risks for young boys are reported in one study to double at only 1.4 mG and above (7) Most other studies combine older children with younger children (0 to 16 years) so that risk levels do not reach statistical significance until exposure levels reach 2 mG or 3 mG. Although some reviews have combined studies of childhood leukemia in ways that indicate the risk level starts at 4 mG and above; this does not reflect many of the studies reporting elevated risks at the lower exposure levels of 2 mG and 3 mG.

2. Other Childhood Cancers

Other childhood cancers have been studied, including brain tumors, but not enough work has been done to know if there are risks, how high these risks might be or what exposure levels might be associated with increased risks. The lack of certainty about other childhood cancers should not be taken to signal the "all clear"; rather it is a lack of study.

The World Health Organization ELF Health Criteria Monograph No 322 (2007) says that other childhood cancers "cannot be ruled out". (8)

There is some evidence that other childhood cancers may be related to ELF exposure but not enough studies have been done.

Several recent studies provide even stronger evidence that ELF is a risk factor for childhood leukemia and cancers later in life. In the first study (9), children who were recovering in high-

ELF environments had poorer survival rates (a 450% increased risk of dying if the ELF fields were 3 mG and above). In the second study, children who were recovering in 2 mG and above ELF environments were 300% more likely to die than children exposed to 1 mG and below. In this second study, children recovering in ELF environments between 1 and 2 mG also had poorer survival rates, where the increased risk of dying was 280%. (10) These two studies give powerful new information that ELF exposures in children can be harmful at levels above even 1 mG. The third study looked what risks for cancer a child would have later in life, if that child was raised in a home within 300 meters of a high-voltage electric power line. (11) For children who were raised for their first five years of life within 300 meters, they have a life-time risk that is 500% higher for developing some kinds of cancers.

Children who have leukemia and are in recovery have poorer survival rates if their ELF exposure at home (or where they are recovering) is between 1mG and 2 mG in one study; over 3 mG in another study.

Given the extensive study of childhood leukemia risks associated with ELF, and the relatively consistent findings that exposures in the 2 mG to 4 mG range are associated with increased risk to children, a 1 mG limit for habitable space is recommended for new construction. While it is difficult and expensive to retrofit existing habitable space to a 1 mG level, and is also recommended as a desirable target for existing residences and places where children and pregnant women may spend prolonged periods of time.

New ELF public exposure limits are warranted at this time, given the existing scientific evidence and need for public health policy intervention and prevention.

3. Brain Tumors and Acoustic Neuromas

Radiofrequency radiation from cell phone and cordless phone exposure has been linked in more than one dozen studies to increased risk for brain tumors and/or acoustic neuromas (a tumor in the brain on a nerve related to our hearing).

People who have used a cell phone for ten years or more have higher rates of malignant brain tumor and acoustic neuromas. It is worse if the cell phone has been used primarily on one side of the head.

For brain tumors, people who have used a cell phone for 10 years or longer have a 20% increase in risk (when the cell phone is used on both sides of the head). For people who have used a cell phone for 10 years or longer predominantly on one side of the head, there is a 200% increased

risk of a brain tumor. This information relies on the combined results of many brain tumor/cell phone studies taken together (a meta-analysis of studies).

People who have used a cordless phone for ten years or more have higher rates of malignant brain tumor and acoustic neuromas. It is worse if the cordless phone has been used primarily on one side of the head.

The risk of brain tumor (high-grade malignant glioma) from cordless phone use is 220% higher (both sides of the head). The risk from use of a cordless phone is 470% higher when used mostly on only one side of the head.

For acoustic neuromas, there is a 30% increased risk with cell phone use at ten years and longer; and a 240% increased risk of acoustic neuroma when the cell phone is used mainly on one side of the head. These risks are based on the combined results of several studies (a meta-analysis of studies).

For use of cordless phones, the increased risk of acoustic neuroma is three-fold higher (310%) when the phone is mainly used on one side of the head.

The current standard for exposure to the emissions of cell phones and cordless phones is not safe considering studies reporting long-term brain tumor and acoustic neuroma risks.

Other indications that radiofrequency radiation can cause brain tumors comes from exposures to low-level RF other than from cell phone or cordless phone use. Studies of people who are exposed in their work (occupational exposure) show higher brain tumor rates as well. Kheifets (1995) reported a 10% to 20% increased risk of brain cancer for those employed in electrical occupations. This meta-analysis surveyed 29 published studies of brain cancer in relation to occupational EMFs exposure or work in electrical occupations. (6). The evidence for a link between other sources of RF exposure like working at a job with EMFs exposure is consistent with a moderately elevated risk of developing brain tumors.

4. *Other Adult Cancers*

There are multiple studies that show statistically significant relationships between occupational exposure and leukemia in adults (see Chapter 11), in spite of major limitations in the exposure assessment. A very recent study by Lowenthal et al. (2007) investigated leukemia in adults in relation to residence near to high-voltage power lines. While they found elevated risk in all adults living near to the high voltage power lines, they found an OR of 3.23 (95% CI = 1.26-8.29) for individuals who spent the first 15 years of life within 300 m of the power line. This study provides support for two important conclusions: adult leukemia is also associated with EMF exposure, and exposure during childhood increases risk of adult disease.

A significant excess risk for adult brain tumors in electrical workers and those adults with occupational EMF exposure was reported in a meta-analysis (review of many individual studies) by Kheifets et al., (1995). This is about the same size risk for lung cancer and secondhand smoke (US DHHS, 2006). A total of 29 studies with populations from 12 countries were included in this meta-analysis. The relative risk was reported as 1.16 (CI = 1.08 – 1.24) or a 16% increased risk for all brain tumors. For gliomas, the risk estimate was reported to be 1.39 (1.07 – 1.82) or a 39% increased risk for those in electrical occupations. A second meta-analysis published by Kheifets et al., ((2001) added results of 9 new studies published after 1995. It reported a new pooled estimate (OR = 1.16, 1.08 – 1.01) that showed little change in the risk estimate overall from 1995.

The evidence for a relationship between exposure and breast cancer is relatively strong in men (Erren, 2001), and some (by no means all) studies show female breast cancer also to be elevated with increased exposure (see Chapter 12). Brain tumors and acoustic neuromas are more common in exposed persons (see Chapter 10). There is less published evidence on other cancers, but Charles et al. (2003) report that workers in the highest 10% category for EMF exposure were twice as likely to die of prostate cancer as those exposed at lower levels (OR 2.02, 95% CI = 1.34-3.04). Villeneuve et al. (2000) report statistically significant elevations of non-Hodgkin's lymphoma in electric utility workers in relation to EMF exposure, while Tynes et al. (2003) report elevated rates of malignant melanoma in persons living near to high voltage power lines. While these observations need replication, they suggest a relationship between exposure and cancer in adults beyond leukemia.

In total the scientific evidence for adult disease associated with EMF exposure is sufficiently strong for adult cancers that preventive steps are appropriate, even if not all reports have shown exactly the same positive relationship. This is especially true since many factors reduce our ability to see disease patterns that might be related to EMF exposure: there is no unexposed population for comparison, for example, and other difficulties in exposure assessment, The evidence for a relationship between EMF exposure and adult cancers and neurodegenerative diseases is sufficiently strong at present to merit preventive actions to reduce EMF exposure.

5. *Breast Cancer*

There is rather strong evidence from multiple areas of scientific investigation that ELF is related to breast cancer. Over the last two decades there have been numerous epidemiological studies (studies of human illness) on breast cancer in both men and women, although this relationship remains controversial among scientists. Many of these studies report that ELF exposures are related to increased risk of breast cancer (not all studies report such effects, but then, we do not expect 100% or even 50% consistency in results in science, and do not require it to take reasonable preventative action).

The evidence from studies on women in the workplace rather strongly suggests that ELF is a risk factor for breast cancer for women with long-term exposures of 10 mG and higher.

Breast cancer studies of people who work in relatively high ELF exposures (10 mG and above) show higher rates of this disease. Most studies of workers who are exposed to ELF have defined high exposure levels to be somewhere between 2 mG and 10 mG; however this kind of mixing of

relatively low to relatively high ELF exposure just acts to dilute out real risk levels. Many of the occupational studies group exposures so that the highest group is exposed to 4 mG and above. What this means is that a) few people are exposed to much higher levels and b) illness patterns show up at relatively low ELF levels of 4 mG and above. This is another way of demonstrating that existing ELF limits that are set at 933-1000 mG are irrelevant to the exposure levels reporting increased risks.

Laboratory studies that examine human breast cancer cells have shown that ELF exposure between 6 mG and 12 mG can interfere with protective effects of melatonin that fights the growth of these breast cancer cells. For a decade, there has been evidence that human breast cancer cells grow faster if exposed to ELF at low environmental levels. This is thought to be because ELF exposure can reduce melatonin levels in the body. The presence of melatonin in breast cancer cell cultures is known to reduce the growth of cancer cells. The absence of melatonin (because of ELF exposure or other reasons) is known to result in more cancer cell growth.

Laboratory studies of animals that have breast cancer tumors have been shown to have more tumors and larger tumors when exposed to ELF and a chemical tumor promoter at the same time. These studies taken together indicate that ELF is a likely risk factor for breast cancer, and that ELF levels of importance are no higher than many people are exposed to at home and at work. A reasonable suspicion of risk exists and is sufficient evidence on which to recommend new ELF limits; and to warrant preventative action.

Given the very high lifetime risks for developing breast cancer, and the critical importance of prevention; ELF exposures should be reduced for all people who are in high ELF environments for prolonged periods of time.

Reducing ELF exposure is particularly important for people who have breast cancer. The recovery environment should have low ELF levels given the evidence for poorer survival rates for childhood leukemia patients in ELF fields over 2 mG or 3 mG. Preventative action for those who may be at higher risk for breast cancer is also warranted (particularly for those taking tamoxifen as a way to reduce the risk of getting breast cancer, since in addition to reducing the effectiveness of melatonin, ELF exposure may also reduce the effectiveness of tamoxifen at these same low exposure levels). There is no excuse for ignoring the substantial body of evidence we already have that supports an association between breast cancer and ELF exposure; waiting for conclusive evidence is untenable given the enormous costs and societal and personal burdens caused by this disease.

Studies of human breast cancer cells and some animal studies show that ELF is likely to be a risk factor for breast cancer. There is supporting evidence for a link between breast cancer and exposure to ELF that comes from cell and animal studies, as well as studies of human breast cancers.

These are just some of the cancer issues to discuss. It may be reasonable now to make the assumption that all cancers, and other disease endpoints might be related to, or worsened by exposures to EMFs (both ELF and RF).

If one or more cancers are related, why would not all cancer risks be at issue? It can no longer be said that the current state of knowledge rules out or precludes risks to human health. The enormous societal costs and impacts on human suffering by not dealing proactively with this issue require substantive public health policy actions; and actions of governmental agencies charged with the protection of public health to act on the basis of the evidence at hand.

B. Changes in the Nervous System and Brain Function

Exposure to electromagnetic fields has been studies in connection with Alzheimer's disease, motor neuron disease and Parkinson's disease. (4) These diseases all involve the death of specific neurons and may be classified as neurodegenerative diseases. There is evidence that high levels of amyloid beta are a risk factor for Alzheimer's disease, and exposure to ELF can increase this substance in the brain. There is considerable evidence that melatonin can protect the brain against damage leading to Alzheimer's disease, and also strong evidence that exposure to ELF can reduce melatonin levels. Thus it is hypothesized that one of the body's main protections against developing Alzheimer's disease (melatonin) is less available to the body when people are exposed to ELF. Prolonged exposure to ELF fields could alter calcium (Ca2+) levels in neurons and induce oxidative stress (4). It is also possible that prolonged exposure to ELF fields may stimulate neurons (particularly large motor neurons) into synchronous firing, leading to damage by the buildup of toxins.

Evidence for a relationship between exposure and the neurodegenerative diseases, Alzheimer's and amyotrophic lateral sclerosis (ALS), is strong and relatively consistent (see Chapter 12). While not every publication shows a statistically significant relationship between exposure and disease, ORs of 2.3 (95% CI = 1.0-5.1 in Qio et al., 2004), of 2.3 (95% CI = 1.6-3.3 in Feychting et al., 2003) and of 4.0 (95% CI = 1.4-11.7 in Hakansson et al., 2003) for Alzheimer's Disease, and of 3.1 (95% CI = 1.0-9.8 in Savitz et al., 1998) and 2.2 (95% CI = 1.0-4.7 in Hakansson et al., 2003) for ALS cannot be simply ignored.

Alzheimer's disease is a disease of the nervous system. There is strong evidence that long-term exposure to ELF is a risk factor for Alzheimer's disease.

Concern has also been raised that humans with epileptic disorders could be more susceptible to RF exposure. Low-level RF exposure may be a stressor based on similarities of neurological effects to other known stressors; low-level RF activates both endogenous opioids and other substances in the brain that function in a similar manner to psychoactive drug actions. Such effects in laboratory animals mimic the effects of drugs on the part of the brain that is involved in addiction.

Laboratory studies show that the nervous system of both humans and animals is sensitive to ELF and RF. Measurable changes in brain function and behavior occur at levels associated with new technologies including cell phone use. Exposing humans to cell phone radiation can change

brainwave activity at levels as low as 0.1 watt per kilogram SAR (W/Kg)*** in comparison to the US allowable level of 1.6 W/Kg and the International Commission for Non-ionizing Radiation Protection (ICNIRP) allowable level of 2.0 W/Kg. It can affect memory and learning. It can affect normal brainwave activity. ELF and RF exposures at low levels are able to change behavior in animals.

There is little doubt that electromagnetic fields emitted by cell phones and cell phone use affect electrical activity of the brain.

Effects on brain function seem to depend in some cases on the mental load of the subject during exposure (the brain is less able to do two jobs well simultaneously when the same part of the brain is involved in both tasks). Some studies show that cell phone exposure speeds up the brain's activity level; but also that the efficiency and judgment of the brain are diminished at the same time. One study reported that teenage drivers had slowed responses when driving and exposed to cell phone radiation, comparable to response times of elderly people. Faster thinking does not necessarily mean better quality thinking.

Changes in the way in which the brain and nervous system react depend very much on the specific exposures. Most studies only look at short-term effects, so the long-term consequences of exposures are not known.

Factors that determine effects can depend on head shape and size, the location, size and shape of internal brain structures, thinness of the head and face, hydration of tissues, thickness of various tissues, dialectric constant of the tissues and so on. Age of the individual and state of health also appear to be important variables. Exposure conditions also greatly influence the outcome of studies, and can have opposite results depending on the conditions of exposure including frequency, waveform, orientation of exposure, duration of exposure, number of exposures, any pulse modulation of the signal, and when effects are measured (some responses to RF are delayed). There is large variability in the results of ELF and RF testing, which would be expected based on the large variability of factors that can influence test results. However, it is clearly demonstrated that under some conditions of exposure, the brain and nervous system functions of humans are altered. The consequence of long-term or prolonged exposures have not been thoroughly studied in either adults or in children.

The consequence of prolonged exposures to children, whose nervous systems continue to develop until late adolescence, is unknown at this time. This could have serious implications to adult health and functioning in society if years of exposure of the young to both ELF and RF result in diminished capacity for thinking, judgment, memory, learning, and control over behavior.

People who are chronically exposed to low-level wireless antenna emissions report symptoms such as problems in sleeping (insomnia), fatigue, headache, dizziness, grogginess, lack of concentration, memory problems, ringing in the ears (tinnitus), problems with balance and orientation, and difficulty in multi-tasking. In children, exposures to cell phone radiation have resulted in changes in brain oscillatory activity during some memory tasks. Although scientific studies as yet have not been able to confirm a cause-and-effect relationship; these complaints are widespread and the cause of significant public concern in some countries where wireless technologies are fairly mature and widely distributed (Sweden, Denmark, France, Germany, Italy, Switzerland, Austria, Greece, Israel). For example, the roll-out of the new 3rd Generation wireless phones (and related community-wide antenna RF emissions in the Netherlands) caused almost immediate public complaints of illness.(5)

Conflicting results from those few studies that have been conducted may be based on the difficulty in providing non-exposed environments for testing to compare to environments that are intentionally exposed. People traveling to laboratories for testing are pre-exposed to a multitude of RF and ELF exposures, so they may already be symptomatic prior to actual testing. Also complicating this is good evidence that RF exposures testing behavioral changes show delayed results; effects are observed after termination of RF exposure. This suggests a persistent change in the nervous system that may be evident only after time has passed, so is not observed during a short testing period.

The effects of long-term exposure to wireless technologies including emissions from cell phones and other personal devices, and from whole-body exposure to RF transmissions from cell towers and antennas is simply not known yet with certainty. However, the body of evidence at hand suggests that bioeffects and health impacts can and do occur at exquisitely low exposure levels: levels that can be thousands of times below public safety limits.

The evidence reasonably points to the potential for serious public health consequences (and economic costs), which will be of global concern with the widespread public use of, and exposure to such emissions. Even a small increase in disease incidence or functional loss of cognition related to new wireless exposures would have a large public health, societal and economic consequences. Epidemiological studies can report harm to health only after decades of exposure, and where large effects can be seen across “average” populations; so these early warnings of possible harm should be taken seriously now by decision-makers.

C. Effects on Genes (DNA)

Cancer risk is related to DNA damage, which alters the genetic blueprint for growth and development. If DNA is damaged (the genes are damaged) there is a risk that these damaged cells will not die. Instead they will continue to reproduce themselves with damaged DNA, and this is one necessary pre-condition for cancer. Reduced DNA repair may also be an important part of this story. When the rate of damage to DNA exceeds the rate at which DNA can be repaired, there is the possibility of retaining mutations and initiating cancer. Studies on how ELF and RF may affect genes and DNA is important, because of the possible link to cancer.

Even ten years ago, most people believed that very weak ELF and RF fields could not possibly have any effect at all on DNA and how cells work (or are damaged and cannot do their work properly). The argument was that these weak fields are do not possess enough energy (are not physically strong enough) to cause damage. However, there are multiple ways we already know about where energy is not the key factor in causing damage. For example, exposure to toxic chemicals can cause damage. Changing the balance of delicate biological processes, including hormone balances in the body, can damage or destroy cells, and cause illness. In fact, many chronic diseases are directly related to this kind of damage that does not require any heating at all. Interference with cell communication (how cells interact) may either cause cancer directly or promote existing cancers to grow faster.

Using modern gene-testing techniques will probably give very useful information in the future about how EMFs targets and affects molecules in the body. At the gene level, there is some evidence now that EMFs (both ELF and RF) can cause changes in how DNA works. Laboratory studies have been conducted to see whether (and how) weak EMFs fields can affect how genes and proteins function. Such changes have been seen in some, but not all studies.

Small changes in protein or gene expression might be able to alter cell physiology, and might be able to cause later effects on health and well-being. The study of genes, proteins and EMFs is still in its infancy, however, by having some confirmation at the gene level and protein level that weak EMFs exposures do register changes may be an important step in establishing what risks to health can occur.

What is remarkable about studies on DNA, genes and proteins and EMFs is that there should be no effect at all if it were true that EMFs is too weak to cause damage. Scientists who believe that the energy of EMFs is insignificant and unlikely to cause harm have a hard time explaining these changes, so are inclined to just ignore them. The trouble with this view is that the effects are occurring. Not being able to explain these effects is not a good reason to consider them imaginary or unimportant.

The European research program (REFLEX) documented many changes in normal biological functioning in tests on DNA (3). The significance of these results is that such effects are directly related to the question of whether human health risks might occur, when these changes in genes and DNA happen. This large research effort produced information on EMFs effects from more than a dozen different researchers. Some of the key findings included:

> *"Gene mutations, cell proliferation and apoptosis are caused by or result in altered gene and protein expression profiles. The convergence of these events is required for the development of all chronic diseases."* (3)
>
> *"Genotoxic effects and a modified expression of numerous genes and proteins after EMF exposure could be demonstrated with great certainty.*" (3)
>
> *"RF-EMF produced genotoxic effects in fibroblasts, HL-60 cells, granulosa cells of rats and neural progenitor cells derived from mouse embryonic stem cells."* (Participants 2, 3 and 4). (3)
>
> *"Cells responded to RF exposure between SAR levels of 0.3 and 2 W/Kg with a significant increase in single- and double-strand DNA breaks and in micronuclei frequency."* (Participants 2, 3 and 4). (3)

"In HL-60 cells an increase in intracellular generation of free radicals accompanying RF-EMF exposure could clearly be demonstrated." (Participant 2). (3)

"The induced DNA damage was not based on thermal effects and arouses consideration about the environmental safety limits for ELF-EMF exposure." (3)

"The effects were clearly more pronounced in cells from older donors, which could point to an age-related decrease of DNA repair efficiency of ELF-EMF induced DNA strand breaks." (3)

Both ELF and RF exposures can be considered genotoxic (will damage DNA) under certain conditions of exposure, including exposure levels that are lower than existing safety limits.

D. Effects on Stress Proteins (Heat Shock Proteins)

In nearly every living organism, there is a special protection launched by cells when they are under attack from environmental toxins or adverse environmental conditions. This is called a stress response, and what are produced are stress proteins (also known as heat shock proteins). Plants, animals and bacteria all produce stress proteins to survive environmental stressors like high temperatures, lack of oxygen, heavy metal poisoning, and oxidative stress (a cause of premature aging). We can now add ELF and RF exposures to this list of environmental stressors that cause a physiological stress response.

Very low-level ELF and RF exposures can cause cells to produce stress proteins, meaning that the cell recognizes ELF and RF exposures as harmful. This is another important way in which scientists have documented that ELF and RF exposures can be harmful, and it happens at levels far below the existing public safety standards.

An additional concern is that if the stress goes on too long, the protective effect is diminished. There is a reduced response if the stress goes on too long, and the protective effect is reduced. This means the cell is less protected against damage, and it is why prolonged or chronic exposures may be quite harmful, even at very low intensities.

The biochemical pathway that is activated is the same for ELF and for RF exposures, and it is non-thermal (does not require heating or induced electrical currents, and thus the safety standards based on protection from heating are irrelevant and not protective). ELF exposure levels of only 5 to 10 mG have been shown to activate the stress response genes (Table 2, Section 6). The specific absorption rate or SAR is not the appropriate measure of biological threshold or dose, and should not be used as the basis for a safety standard, since SAR only regulates against thermal damage.

E. Effects on the Immune System

The immune system is another defense we have against invading organisms (viruses, bacteria, and other foreign molecules). It protects us against illness, infectious diseases, and tumor cells. There are many different kinds of immune cells; each type of cell has a particular purpose, and is launched to defend the body against different kinds of exposures that the body determines might be harmful.

There is substantial evidence that ELF and RF can cause inflammatory reactions, allergy reactions and change normal immune function at levels allowed by current public safety standards.

The body's immune defense system senses danger from ELF and RF exposures, and targets an immune defense against these fields, much like the body's reaction in producing stress proteins. These are additional indicators that very low intensity ELF and RF exposures are a) recognized by cells and b) can cause reactions as if the exposure is harmful. Chronic exposure to factors that increase allergic and inflammatory responses on a continuing basis are likely to be harmful to health. Chronic inflammatory responses can lead to cellular, tissue and organ damage over time. Many chronic diseases are thought to be related to chronic problems with immune system function.

The release of inflammatory substances, such as histamine, are well-known to cause skin reactions, swelling, allergic hypersensitivity and other conditions that are normally associated with some kind of defense mechanism. The human immune system is part of a general defense barrier that protects against harmful exposures from the surrounding environment. When the immune system is aggravated by some kind of attack, there are many kinds of immune cells that can respond. Anything that triggers an immune response should be carefully evaluated, since chronic stimulation of the immune system may over time impair the system's ability to respond in the normal fashion.

Measurable physiological changes (mast cell increases in the skin, for example that are markers of allergic response and inflammatory cell response) are triggered by ELF and RF at very low intensities. Mast cells, when activated by ELF or RF, will break (degranulate) and release irritating chemicals that cause the symptoms of allergic skin reactions.

There is very clear evidence that exposures to ELF and RF at levels associated with cell phone use, computers, video display terminals, televisions, and other sources can cause these skin reactions. Changes in skin sensitivity have been measured by skin biopsy, and the findings are remarkable. Some of these reactions happen at levels equivalent to those of wireless technologies in daily life. Mast cells are also found in the brain and heart, perhaps targets of immune response by cells responding to ELF and RF exposures, and this might account for some of the other symptoms commonly reported (headache, sensitivity to light, heart arrythmias and other cardiac symptoms). Chronic provocation by exposure to ELF and RF can lead to immune dysfunction, chronic allergic responses, inflammatory diseases and ill health if they occur on a continuing basis over time.

These clinical findings may account for reports of persons with electrical hypersensitivity, which is a condition where there is intolerance for any level of exposure to ELF and/or RF. Although there is not yet a substantial scientific assessment (under controlled conditions, if that is even possible); anecdotal reports from many countries show that estimates range from 3% to perhaps 5% of populations, and it is a growing problem. Electrical hypersensitivity, like multiple chemical sensitivity, can be disabling and require the affected person to make drastic changes in work and living circumstances, and suffer large economic losses and loss of personal freedom. In Sweden, electrohypersensitivity (EHS) is officially recognized as fully functional impairment (i.e., it is not regarded as a disease – see Section 6, Appendix A).

F. Plausible Biological Mechanisms

Plausible biological mechanisms are already identified that can reasonably account for most biological effects reported for exposure to RF and ELF at low-intensity levels (oxidative stress and DNA damage from free radicals leading to genotoxicity; molecular mechanisms at very low energies are plausible links to disease, e.g., effect on electron transfer rates linked to oxidative damage, DNA activation linked to abnormal biosynthesis and mutation). It is also important to remember that traditional public health and epidemiological determinations do not require a proven mechanism before inferring a causal link between EMFs exposure and disease (12). Many times, proof of mechanism is not known before wise public health responses are implemented.

"Obviously, melatonin's ability to protect DNA from oxidative damage has implications for many types of cancer, including leukemia, considering that DNA damage due to free radicals is believed to be the initial oncostatic event in a majority of human cancers [Cerutti et al., 1994]. In addition to cancer, free radical damage to the central nervous system is a significant component of a variety of neurodegenerative diseases of the aged including Alzheimer's disease and Parkinsonism. In experimental animal models of both of these conditions, melatonin has proven highly effective in forestalling their onset, and reducing their severity [Reiter et al., 2001]." (13)

Oxidative stress through the action of free radical damage to DNA is a plausible biological mechanism for cancer and diseases that involve damage from ELF to the central nervous system.

G. Another Way of Looking at EMFs: Therapeutic Uses

Many people are surprised to learn that certain kinds of EMFs treatments actually can heal. These are medical treatments that use EMFs in specific ways to help in healing bone fractures, to heal wounds to the skin and underlying tissues, to reduce pain and swelling, and for other post-surgical needs. Some forms of EMFs exposure are used to treat depression.

EMFs have been shown to be effective in treating conditions of disease at energy levels far below current public exposure standards. This leads to the obvious question. How can scientists dispute

the harmful effects of EMF exposures while at the same time using forms of EMF treatment that are proven to heal the body?

Medical conditions are successfully treated using EMFs at levels below current public safety standards, proving another way that the body recognizes and responds to low-intensity EMF signals. Otherwise, these medical treatments could not work. The FDA has approved EMFs medical treatment devices, so is clearly aware of this paradox.

Random exposures to EMFs, as opposed to EMFs exposures done with clinical oversight, could lead to harm just like the unsupervised use of pharmaceutical drugs. This evidence forms a strong warning that indiscriminate EMF exposure is probably a bad idea.

No one would recommend that drugs used in medical treatments and prevention of disease be randomly given to the public, especially to children. Yet, random and involuntary exposures to EMFs occur all the time in daily life.

The consequence of multiple sources of EMFs exposures in daily life, with no regard to cumulative exposures or to potentially harmful combinations of EMFs exposures means several things. First, it makes it very difficult to do clinical studies because it is almost impossible to find anyone who is not already exposed. Second, people with and without diseases have multiple and overlapping exposures – this will vary from person to person.

Just as ionizing radiation can be used to effectively diagnose disease and treat cancer, it is also a cause of cancer under different exposure conditions. Since EMFs are both a cause of disease, and also used for treatment of disease, it is vitally important that public exposure standards reflect our current understanding of the biological potency of EMF exposures, and develop both new public safety limits and measures to prevent future exposures.

III. EMF EXPOSURE AND PRUDENT PUBLIC HEALTH PLANNING

- **The scientific evidence is sufficient to warrant regulatory action for ELF; and it is substantial enough to warrant preventative actions for RF.**
- **The standard of evidence for judging the emerging scientific evidence necessary to take action should be proportionate to the impacts on health and well-being**
- **The exposures are widespread.**
- **Widely accepted standards for judging the science are used in this assessment.**

Public exposure to electromagnetic radiation (power-line frequencies, radiofrequency and microwave) is growing exponentially worldwide. There is a rapid increase in electrification in developing countries, even in rural areas. Most members of society now have and use cordless phones, cellular phones, and pagers. In addition, most populations are also exposed to antennas in communities designed to transmit wireless RF signals. Some developing countries have even given up running land lines because of expense and the easy access to cell phones. Long-term and cumulative exposure to such massively increased RF has no precedent in human history. Furthermore, the most pronounced change is for children, who now routinely spend hours each day on the cell phone. Everyone is exposed to a greater or lesser extent. No one can avoid exposure, since even if they live on a mountain-top without electricity there will likely be exposure to communication-frequency RF exposure. Vulnerable populations (pregnant women, very young children, elderly persons, the poor) are exposed to the same degree as the general population. Therefore it is imperative to consider ways in which to evaluate risk and reduce exposure. Good public health policy requires preventative action proportionate to the potential risk of harm and the public health consequence of taking no action.

IV. RECOMMENDED ACTIONS

A. Defining new exposure standards for ELF

This chapter concludes that new ELF limits are warranted based on a public health analysis of the overall existing scientific evidence. The public health view is that new ELF limits are needed now. They should reflect environmental levels of ELF that have been demonstrated to increase

risk for childhood leukemia, and possibly other cancers and neurological diseases. ELF limits should be set below those exposure levels that have been linked in childhood leukemia studies to increased risk of disease, plus an additional safety factor. It is no longer acceptable to build new power lines and electrical facilities that place people in ELF environments that have been determined to be risky. These levels are in the 2 to 4 milligauss* (mG) range, not in the 10s of mG or 100s of mG. The existing ICNIRP limit is 1000 mG (904 mG in the US) for ELF is outdated and based on faulty assumptions. These limits are can no longer be said to be protective of public health and they should be replaced. A safety buffer or safety factor should also be applied to a new, biologically-based ELF limit, and the conventional approach is to add a safety factor lower than the risk level.

While new ELF limits are being developed and implemented, a reasonable approach would be a 1 mG planning limit for habitable space adjacent to all new or upgraded power lines and a 2 mG limit for all other new construction. It is also recommended for that a 1 mG limit be established for existing habitable space for children and/or women who are pregnant (because of the possible link between childhood leukemia and *in utero* exposure to ELF). This recommendation is based on the assumption that a higher burden of protection is required for children who cannot protect themselves, and who are at risk for childhood leukemia at rates that are traditionally high enough to trigger regulatory action. This situation in particular warrants extending the 1 mG limit to existing occupied space. "Establish" in this case probably means formal public advisories from relevant health agencies. While it is not realistic to reconstruct all existing electrical distribution systems, in the short term; steps to reduce exposure from these existing systems need to be initiated, especially in places where children spend time, and should be encouraged. These limits should reflect the exposures that are commonly associated with increased risk of child hood leukemia (in the 2 to 5 mG range for all children, and over 1.4 mG for children age 6 and younger). Nearly all of the occupational studies for adult cancers and neurological diseases report their highest exposure category is 4 mG and above, so that new ELF limits should target the exposure ranges of interest, and not necessarily higher ranges.

Avoiding chronic ELF exposure in schools, homes and the workplace above levels associated with increased risk of disease will also avoid most of the possible bioactive parameters of ELF discussed in the relevant literature.

B. Defining preventative actions for reduction in RF exposures

Given the scientific evidence at hand (Chapter 17), the rapid deployment of new wireless technologies that chronically expose people to pulsed RF at levels reported to cause bioeffects, which in turn, could reasonably be presumed to lead to serious health impacts, is of public health concern. Section 17 summarizes evidence that has resulted in a public health recommendation that preventative action is warranted to reduce or minimize RF exposures to the public. There is suggestive to strongly suggestive evidence that RF exposures may cause changes in cell membrane function, cell communication, cell metabolism, activation of proto-oncogenes and can trigger the production of stress proteins at exposure levels below current regulatory limits. Resulting effects can include DNA breaks and chromosome aberrations, cell death including death of brain neurons, increased free radical production, activation of the endogenous opioid system, cell stress and premature aging, changes in brain function including memory loss, retarded learning, slower motor function and other performance impairment in children, headaches and fatigue, sleep disorders, neurodegenerative conditions, reduction in melatonin secretion and cancers (Chapters 5, 6, 7, 8, 9, 10, and 12).

As early as 2000, some experts in bioelectromagnetics promoted a 0.1 μW/cm2 limit (which is 0.614 Volts per meter) for ambient outdoor exposure to pulsed RF, so generally in cities, the public would have adequate protection against involuntary exposure to pulsed radiofrequency (e.g., from cell towers, and other wireless technologies). The Salzburg Resolution of 2000 set a target of 0.1 μW/cm2 (or 0.614 V/m) for public exposure to pulsed radiofrequency. Since then, there are many credible anecdotal reports of unwellness and illness in the vicinity of wireless transmitters (wireless voice and data communication antennas) at lower levels. Effects include sleep disruption, impairment of memory and concentration, fatigue, headache, skin disorders, visual symptoms (floaters), nausea, loss of appetite, tinnitus, and cardiac problems (racing heartbeat), There are some credible articles from researchers reporting that cell tower -level RF exposures (estimated to be between 0.01 and 0.5 μW/cm2) produce ill-effects in populations living up to several hundred meters from wireless antenna sites.

This information now argues for thresholds or guidelines that are substantially below current FCC and ICNIPR standards for whole body exposure. Uncertainty about how low such standards might have to go to be prudent from a public health standpoint should not prevent reasonable

efforts to respond to the information at hand. No lower limit for bioeffects and adverse health effects from RF has been established, so the possible health risks of wireless WLAN and WI-FI systems, for example, will require further research and no assertion of safety at any level of wireless exposure (chronic exposure) can be made at this time. The lower limit for reported human health effects has dropped 100-fold below the safety standard (for mobile phones and PDAs); 1000- to 10,000-fold for other wireless (cell towers at distance; WI-FI and WLAN devices). The entire basis for safety standards is called into question, and it is not unreasonable to question the safety of RF at any level.

A cautionary target level for pulsed RF exposures for ambient wireless that could be applied to RF sources from cell tower antennas, WI-FI, WI-MAX and other similar sources is proposed. The recommended cautionary target level is 0.1 microwatts per centimeter squared (μW/cm2)** (or 0.614 Volts per meter or V/m)** for pulsed RF where these exposures affect the general public; this advisory is proportionate to the evidence and in accord with prudent public health policy. A precautionary limit of 0.1 μW/cm2 should be adopted for outdoor, cumulative RF exposure. This reflects the current RF science and prudent public health response that would reasonably be set for pulsed RF (ambient) exposures where people live, work and go to school. This level of RF is experienced as whole-body exposure, and can be a chronic exposure where there is wireless coverage present for voice and data transmission for cell phones, pagers and PDAs and other sources of radiofrequency radiation. An outdoor precautionary limit of 0.1 μW/cm2 would mean an even lower exposure level inside buildings, perhaps as low as 0.01 μW/cm2. Some studies and many anecdotal reports on ill health have been reported at lower levels than this; however, for the present time, it could prevent some of the most disproportionate burdens placed on the public nearest to such installations. Although this RF target level does not preclude further rollout of WI-FI technologies, we also recommend that wired alternatives to WI-FI be implemented, particularly in schools and libraries so that children are not subjected to elevated RF levels until more is understood about possible health impacts. This recommendation should be seen as an interim precautionary limit that is intended to guide preventative actions; and more conservative limits may be needed in the future.

Broadcast facilities that chronically expose nearby residents to elevated RF levels from AM, FM and television antenna transmission are also of public health concern given the potential for very high RF exposures near these facilities (antenna farms). RF levels can be in the 10s to several 100's of μW/cm2 in residential areas within half a mile of some broadcast sites (for example,

Lookout Mountain, Colorado and Awbrey Butte, Bend, Oregon). Such facilities that are located in, or expose residential populations and schools to elevated levels of RF will very likely need to be re-evaluated for safety.

For emissions from wireless devices (cell phones, personal digital assistant or PDA devices, etc) there is enough evidence for increased risk of brain tumors and acoustic neuromas now to warrant intervention with respect to their use. Redesign of cell phones and PDAs could prevent direct head and eye exposure, for example, by designing new units so that they work only with a wired headset or on speakerphone mode.

These effects can reasonably be presumed to result in adverse health effects and disease with chronic and uncontrolled exposures, and children may be particularly vulnerable. The young are also largely unable to remove themselves from such environments. Second-hand radiation, like second-hand smoke is an issue of public health concern based on the evidence at hand.

V. CONCLUSIONS

• We cannot afford 'business as usual" any longer. It is time that planning for new power lines and for new homes, schools and other habitable spaces around them is done with routine provision for low-ELF environments . The business-as-usual deployment of new wireless technologies is likely to be risky and harder to change if society does not make some educated decisions about limits soon. Research must continue to define what levels of RF related to new wireless technologies are acceptable; but more research should not prevent or delay substantive changes today that might save money, lives and societal disruption tomorrow.

• New regulatory limits for ELF are warranted. ELF limits should be set below those exposure levels that have been linked in childhood leukemia studies to increased risk of disease, plus an additional safety factor. It is no longer acceptable to build new power lines and electrical facilities that place people in ELF environments that have been determined to be risky (at levels generally at 2 mG and above).

• While new ELF limits are being developed and implemented, a reasonable approach would be a 1 mG planning limit for habitable space adjacent to all new or upgraded power lines and a 2 mG limit for all other new construction, It is also recommended for that a 1 mG limit be established for existing habitable space for children and/or women who are pregnant . This recommendation is based on the assumption that a higher burden of protection is required for children who cannot protect themselves, and who are at risk for childhood leukemia at rates that are traditionally high enough to trigger regulatory action. This situation in particular warrants extending the 1 mG limit to existing occupied space. "Establish" in this case probably means formal public advisories from relevant health agencies.

• While it is not realistic to reconstruct all existing electrical distributions systems, in the short term; steps to reduce exposure from these existing systems need to be initiated, especially in places where children spend time, and should be encouraged.

• A precautionary limit of 0.1 (μW/cm2 (which is also 0.614 Volts per meter) should be adopted for outdoor, cumulative RF exposure. This reflects the current RF science and prudent public health response that would reasonably be set for pulsed RF (ambient) exposures where people live, work and go to school. This level of RF is experienced as whole-body exposure, and can be a chronic exposure where there is wireless coverage present for voice and data transmission for cell phones, pagers and PDAs and other sources of radiofrequency radiation. Some studies and many anecdotal reports on ill health have been reported at lower levels than this; however, for the present time, it could prevent some of the most disproportionate burdens placed on the public nearest to such installations. Although this RF target level does not preclude further rollout of WI-FI technologies, we also recommend that wired alternatives to WI-FI be implemented, particularly in schools and libraries so that children are not subjected to elevated RF levels until more is understood about possible health impacts. This recommendation should be seen as an interim precautionary limit that is intended to guide preventative actions; and more conservative limits may be needed in the future.

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Some Quick Definitions for Units of Measurement of ELF and RF

***Milligauss (mG)**

A milligauss is a measure of ELF intensity and is abbreviated mG. This is used to describe electromagnetic fields from appliances, power lines, interior electrical wiring.

****Microwatts per centimeter squared (µW/cm2)**

Radiofrequency radiation in terms of power density is measured in microwatts per centimeter squared and abbreviated (µW/cm2). It is used when talking about emissions from wireless facilities, and when describing ambient RF in the environment. The amount of allowable RF near a cell tower is 1000 µW/cm2 for some cell phone frequencies, for example.

*****Specific Absorption Rate (SAR is measured in watts per kilogram or W/Kg)**

SAR stands for specific absorption rate. It is a calculation of how much RF energy is absorbed into the body, for example when a cell phone or cordless phone is pressed to the head. SAR is expressed in watts per kilogram of tissue (W/Kg). The amount of allowable energy into 1 gram of brain tissue from a cell phone is 1.6 W/Kg in the US. For whole body exposure, the exposure is 0.8 W/Kg averaged over 30 minutes for the general public. International standards in most countries are similar, but not exactly the same.

How Exposure to Base-station Radiation can Adversely Affect Humans*

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The claim made by the Mobile Phone Industry that the microwave emissions from the antennae of a GSM or TETRA Base-station are many times lower (by at least a factor of 1000) than the limit to which the UK Government's Statutory Body – the National Radiological Protection Board (NRPB) – maintains it is safe for us to be exposed to, is perfectly true.

The current exposure limits, set by the International Commission for Non-ionising Radiation Protection (ICNIRP), are, however, purely thermally based - *i.e.* they simply limit the intensity of the radiation to ensure that the amount of tissue heating by the absorption of microwaves is not in excess of what the body can cope with. If heating were the only effect of the radiation, existing guidelines would afford adequate protection; unfortunately, however, this is not the case. For microwaves are, after all, waves, and, as such, have properties other than solely intensity. In particular, the pulsed microwave radiation used in the GSM and TETRA systems of mobile telephony has certain rather well defined frequencies, which facilitate its discernment by the alive human organism, and *via* which the organism can, in turn, be affected in a purely *non-thermal* way. This is so because the alive human organism (and only the alive one) itself supports a variety of oscillatory electrical biological activities, each characterised by a specific frequency, *some of which happen be close to those used in GSM and TETRA*. Thus, the frequencies of the microwaves (particularly the higher ones used in GSM) that carry the voice information by means of appropriate modulations are close to those characterising the highly organised electrical activities that are involved in the control of certain biological processes in living organisms at the cellular level (including processes as fundamental as cell division), whilst the somewhat lower frequencies used in TETRA facilitate deeper penetration of this radiation. On the other hand, the rates at which the microwaves are emitted in distinct groups of flashes (or pulses) are close to the frequencies of some of the brain's own electrical and electrochemical rhythms, which this makes them particularly vulnerable to interference (or even entrainment) by the radiation. [The basic 'flash rate' is 217Hz, but the flashes are emitted in groups of 25 at the rate of 8.34Hz. With increasing call traffic, the 217Hz pulsing gradually disappears, leaving only the ELF pulsation at 8.34Hz, which is in the range of the alpha brain wave activity!] It is to be stressed that unlike heating, such non-thermal influences are possible only when the organism is alive: the Dead have no electrical brain activity with which an external electromagnetic field can interfere!

What the Industry and the various regulatory bodies (such as the NRPB and ICNIRP) dispute is that the very weak, pulsed microwave radiation used in GSM and TETRA can **non**-thermally affect these various biological (electrical) activities in ways that can provoke adverse health reactions. Their difficulty in accepting this reality is due to an out-dated 'linear' mentality, within which forces the conclusion that exposure to weak radiation can entail only correspondingly weak effects, and *vice versa*. Whilst this is true in the case of inanimate systems and dead organisms, it is certainly not so either for energised electronic equipment, or for **living organisms**. For the latter, in consequence of their *vitality*, are themselves **electromagnetic instruments of great and exquisite sensitivity**, and thereby vulnerable to interference by weak external electromagnetic fields whose frequencies are close to those found in the alive organism. The situation is not dissimilar to the way in which the reception of a (turned-on) radio that is tuned to a particular frequency can be interfered with by a signal that is slightly off-station. In both cases, it is more a question of the 'information' content of a given (interfering) signal, rather than how much energy it contains (or equivalently, its ability to heat tissue). Whilst the importance of ensuring *non-thermal* electromagnetic compatibility between mobile phone radiation and energised electronic equipment (in aircraft and hospitals, and with heart pacemakers, for example) is accepted and generally respected, the same, unfortunately, does not yet obtain in the case of the alive human organism!

Despite persistent claims to the contrary by the Mobile Phone Industry, the existence of non-thermal effects of low intensity, pulsed microwave radiation is established beyond dispute, on the basis of many replicated experiments that have been performed over the last 30 years on a variety of living organisms. The results of these experiments have been published in international, peer reviewed scientific journals, and are endorsed by the 16 signatories (of international standing) to the 1998 Vienna Resolution, the only non-signatory being the head of the WHO Project on Electromagnetic Fields!

Of particular relevance is the way in which this radiation affects *brain function* – specifically, its electrical activity (EEG), its electro-chemistry, and the blood/ brain barrier - and degrades the *immune system*. For these established influences are of a kind that are ***consistent*** with the nature of adverse health reactions reported both by some users of mobile phones and by some people (involuntarily) subject to long-term exposure to the radiation from Base-stations. For example, the radiation is known to affect the dopamine-opiate system of the brain and to increase the permeability of the blood brain barrier, both of which are medically considered to underlie headache – one of the most persistently reported adverse health effects. Similarly, the duration of REM sleep is shortened by exposure to radio-frequency radiation, whilst nocturnal secretion of melatonin is partly inhibited, both of which are consistent with reports of sleep disruption. Furthermore, the fact that microwave radiation has been discovered to target the hippocampal region of the brain is consistent with reports of memory problems and, in some epileptic children, with an increase in the frequency of seizures. The latter finding is not at all unreasonable, given the known ability of a visible light (such as a stroboscope) flashing at a rate somewhere between 15-20 times per second to provoke seizures in the 5% minority of epileptics who are photosensitive. For visible light and microwaves are both simply different realisations of electromagnetic radiation, and the microwave radiation used in GSM and TETRA similarly 'flashes' in a way that the brain is able to recognise, as has already been mentioned; unlike visible light, however, pulsed microwaves can penetrate the skull directly. Of particular concern is that the flash frequency of the TETRA signals is not only within to the range where photoepilepsy can be provoked, but is also very close to the frequency that causes the maximum loss of calcium from brain cells, thereby potentially undermining the integrity of the nervous system.

It should be noted that although microwave radiation is non-ionising – *i.e.* does not have enough energy to break chemical bonds, particularly in DNA – exposure can still cause interference with the natural DNA *repair* process, and produce chromosome aberrations and micronuclei. Such effects are consistent with the finding that exposure to pulsed microwave radiation (at intensities comparable to those realised during use of a mobile phone) promotes the development of cancer in mice that have been genetically engineered to have a predisposition to cancer, and also with the 2-fold increase in the incidence of a rare form of cancer in the periphery of the human brain (where the radiation from the handset most easily penetrates) - the laterality of which correlates with that of handset use - which has been found in a recent nationwide epidemiological study in the US. The relevance of these disturbing findings to the less intense, but often more prolonged, exposure to Base-station radiation is at present unknown, but the increasing number of reports of serious adverse effects in animals exposed to such radiation could well be valuable warning portents that should not be ignored.

It is essential to appreciate, however, that because the possibility of non-thermal influences is dependent on the organism being alive, it necessarily follows that **not everyone will be equally susceptible**, even under the same exposure conditions - susceptibility depending on the physiological state of the individual when irradiated, such as the stability of the brain's electrical activity and the person's level of stress prior to exposure. Whilst this admittedly makes the occurrence of non-thermal effects more difficult to predict than is the case with thermal effects – and hence to regulate against – *it does not mean that they can be safely ignored, or that they cannot provoke adverse health reactions in some people*, the severity of which will again vary from person to person, according to the robustness of their immune system. It is probably true to say that if the same degree of risk and uncertainty as to subjective noxiousness obtained in the case of a new drug or foodstuff, they would never be licensed. In connection with the biological noxiousness of low intensity microwave radiation, it should not be forgotten that during the 'Cold War', such radiation was used (rather successfully) by the Soviets to induce serious adverse health effects in the staff of Western Embassies in Eastern bloc countries, as well as in their children!

Quite apart from their weaker immune systems, children are particularly vulnerable because of the increased rate at which their cells divide (which makes them more susceptible to genetic damage) and their still developing nervous system - the size of their heads and the thinness of their skulls causing them to absorb more radiation than do adults. Particularly vulnerable to interference by the pulses of microwaves, is their electrical brain-wave activity, which does not settle into a stable pattern until about the age of 11 or 12 years. The use of mobile phones by pre-adolescent children is thus to be strongly discouraged, and the siting of Base-station masts in the vicinity of schools and nurseries resisted: financial gain must not be allowed to be the overriding consideration! It must be appreciated that whilst the intensity to which the Public is normally exposed in the vicinity of a Base-station is indeed very much lower than that encountered during use of a mobile phone, the **information** content of the signals is the **same**, so that they are equally potentially noxious.

To cite the examples of radio and television transmission in an attempt to support the claim that exposure to the (much less intense) radiation used in mobile telephony is flawed, on account of *(i)* the occurrence, in any case, of certain health problems that correlate with exposure to the radiation from these installations, *(ii)* the fact that, *unlike the radiation used in GSM and some TETRA installations*, this radiation is **not** emitted as pulses, in patterns that the brain can recognise, and *(iii)* the fact that the lower frequency carriers used in radio and TV are somewhat less biologically active than are higher microwave carrier frequencies used in GSM.

In conclusion, it can hardly be disputed that to enjoy an acceptable quality of life requires more than simply an absence of terminal disease. Adverse health effects in humans of the kinds already consistently reported worldwide – such as headaches, sleep disruption, impairment of short–term memory, *etc*. - whilst maybe not life-threatening in themselves, do nevertheless have a debilitating effect that undoubtedly undermines the general well-being of those affected, and which in the case of some children could well undermine their neurological and academic development. It should, of course, be stressed that the apparent absence to date of life threatening adverse effects on a global scale attributable to exposure to GSM or TETRA Base-station radiation is no guarantee of immunity in the long-term. For exposure to this kind of radiation is still in its 'early days' in comparison to the much longer (10-15 years) latency period of the kinds of cancers that could well be promoted or initiated in certain people.

REFERENCE: G.J. Hyland, 'On the Inadequacy of Existing Safety Guidelines' – *ww.tassie.net.au/emfacts/mobiles/hyland2.html*

The GSM and TETRA systems deployed in Europe are similar to PCS/Digital in the United States.
In the U.S. human exposure to RF/MW radiation is regulated by the Federal Communications Commission (FCC) based on standards developed by the private organizations American National Standards Institute (ANSI) and the Institute of Electrical and Electronics Engineers (IEEE). The status of the non-ionzing radiation committee at the National Council on Radiation Protection and Measurement (NCRP),

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ORIGINAL CONTRIBUTIONS

Cancer Incidence near Radio and Television Transmitters in Great Britain

I. Sutton Coldfield Transmitter

Helen Dolk,[1] Gavin Shaddick,[1] Peter Walls,[1] Chris Grundy,[1] Bharat Thakrar,[1] Immo Kleinschmidt,[1] and Paul Elliott[2]

A small area study of cancer incidence in 1974–1986 was carried out to investigate an unconfirmed report of a "cluster" of leukemias and lymphomas near the Sutton Coldfield television (TV) and frequency modulation (FM) radio transmitter in the West Midlands, England. The study used a national database of postcoded cancer registrations, and population and socioeconomic data from the 1981 census. Selected cancers were hematopoietic and lymphatic, brain, skin, eye, male breast, female breast, lung, colorectal, stomach, prostate, and bladder. Expected numbers of cancers in small areas were calculated by indirect standardization, with stratification for a small area socioeconomic index. The study area was defined as a 10 km radius circle around the transmitter, within which 10 bands of increasing distance from the transmitter were defined as a basis for testing for a decline in risk with distance, and an inner area was arbitrarily defined for descriptive purposes as a 2 km radius circle. The risk of adult leukemia within 2 km was 1.83 (95% confidence interval 1.22–2.74), and there was a significant decline in risk with distance from the transmitter ($p = 0.001$). These findings appeared to be consistent over the periods 1974–1980 and 1981–1986, and were probably largely independent of the initially reported cluster, which appeared to concern mainly a later period. In the context of variability of leukemia risk across census wards in the West Midlands as a whole, the Sutton Coldfield findings were unusual. A significant decline in risk with distance was also found for skin cancer, possibly related to residual socioeconomic confounding, and for bladder cancer. Study of other radio and TV transmitters in Great Britain is required to put the present results in wider context. No causal implications can be made from a single cluster investigation of this kind. *Am J Epidemiol* 1997;145:1–9.

electromagnetic fields; leukemia; neoplasms; radio waves

There has been considerable public and scientific debate concerning the possible adverse health effects associated with environmental exposure to extremely low frequency (0–300 Hz) non-ionizing radiation, as emitted by power cables and electric substations (1–5). Exposure to extremely low frequency radiation has most commonly been associated with leukemia, particularly acute myeloid and childhood leukemia, and also brain cancer, male breast cancer, and skin and eye melanoma (1, 3, 6–12), although there is currently no agreement as to causality (2–5).

Far less attention has been paid to environmental

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Abbreviations: CI, confidence interval; erp, effective radiated power; FM, frequency modulation; ICD, *International Classification of Diseases*; O/E ratio, observed/expected ratio; TV, television.

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exposure to radiation in the radiofrequency range (100 kHz to 300 GHz), including television (TV) and frequency modulation (FM) broadcast frequencies (30 MHz to 1 GHz), at field strengths below those required to produce thermal effects. The few epidemiologic studies that have reported on cancer incidence in relation to radiofrequency radiation (mainly from occupational exposure including microwave and radar) have generally presented negative or inconsistent results, or were subject to possible confounding from other exposures (2, 13–22). A study of residential exposure in Hawaii examined cancer incidence for census tracts with broadcasting antennae (22). A significantly increased relative risk of all cancers was found (standard incidence ratio (SIR) = 1.36 based on 905 cases, $p < 0.01$), and there was a nonsignificant excess of leukemias (SIR = 1.56 based on 23 cases, $p > 0.01$). However, there was only limited control for possible confounding.

Nevertheless, concerns have been expressed about the possible health effects of living near high power radio transmitters. Following a claim (see Appendix) of an excess of cases of leukemia and lymphoma near the Sutton Coldfield radio and television transmitter in the West Midlands, England, the Small Area Health Statistics Unit in the United Kingdom (23) was asked to investigate the incidence of selected cancers in the vicinity. The results of those analyses are reported here.

MATERIALS AND METHODS

The Sutton Coldfield transmitter is sited at the northern edge of the city of Birmingham. It first came into service in 1949 for television. High power transmission at 1 megawatt effective radiated power (erp) per frequency began with one frequency in 1964, rose to 3 frequencies in 1969, and then 4 frequencies in 1982. Three frequencies of very high frequency (VHF) radio began in 1957, at 250 kW erp per frequency. The mast is 240 m high. There are no big hills (above the height of the transmitter) in the study area. Nearby industrial processes registered with Her Majesty's Inspectorate of Pollution include a mineral works 3 km east, a copper works 6.5 km west, and a lead works 7 km west (Department of the Environment, personal communication, 1993).

Cancer incidence data postcoded to address at diagnosis were examined from 1974 to 1986. Population statistics were from the 1981 census enumeration districts and wards. The study area was defined by a circle of 10 km radius centered on the transmitter, grid reference SK 113003 (figure 1). The population within 10 km was around 408,000. Within the study area, ten bands of outer radius 0.5, 1, 2, 3, 4.9, 6.3, 7.4, 8.3, 9.2, and 10 km were defined (giving equal areas beyond 3 km). Populations and cases were located in the study area via the postcode of residence (which refers to an average of 14 households in Great Britain) according to methods described elsewhere (23). The completeness of postcoding of cancer registrations is high both nationally (96.6 percent) and in the West Midlands region (98.7 percent).

The following cancers at ages 15 years and over were considered as a priori groupings according to the 8th and 9th revisions of the *International Classification of Diseases* (ICD):

1) all cancers, excluding non-melanoma skin cancer (ICD-8/9 code 173);

2) cancers of the type stated in the initial cluster report, i.e., hematopoietic and lymphatic cancers: all leukemias (ICD-8/9 code 204–207 + ICD-9 code 208); multiple myeloma (ICD-8/9 code 203 + ICD-9 code 238.6), non-Hodgkin's lymphoma (ICD-8/9 code 200 + ICD-8 code 202 + ICD-9 codes 202.0, 201.1, 202.8); all hematopoietic and lymphatic (all leukemias, multiple myeloma, non-Hodgkin's lymphoma and ICD-8/9 code 201); all leukemias and non-Hodgkin's lymphoma combined; all leukemias; acute leukemia, i.e., acute myeloid leukemia (205.0) and acute lymphatic leukemia (204.0) separately, and combined with ICD-8/9 code 206.0 + ICD-9 codes 204.2, 205.2, 206.2, 208.0, 208.2 + ICD-8 code 207.0; chronic myeloid leukemia (205.1); chronic lymphatic leukemia (204.1);

3) cancers possibly associated with non-ionizing radiation (1, 3, 6–12), i.e., malignant brain and nervous system cancers (ICD-8/9 codes 191, 192); brain and nervous system cancers of malignant, benign, and uncertain behavior (ICD-8/9 codes 191, 192 + ICD-8/9 code 225 + ICD-9 codes 237.5, 237.6, 237.9); skin melanoma (ICD-8/9 code 172); eye (mainly melanoma) (ICD-8/9 code 190); male breast (ICD-8 codes 174.0–2, ICD-9 code 175);

4) common cancers (examined separately), i.e., lung (162), colon (ICD-8 codes 153.0–3, 153.7–8, ICD-9 code 153), rectal (154), colorectal (colon + rectal), stomach (ICD-8/9 code 151), bladder (ICD-8/9 code 188), prostate (ICD-8/9 code 185), female breast (ICD-8 codes 174.0–2, ICD-9 code 174).

Childhood cancer (0–14 years) was restricted to all cancers and all leukemias.

To allow for possible socioeconomic confounding, a deprivation score, shown elsewhere to be a powerful predictor of cancer rates (24), was calculated for each census enumeration district in Great Britain using 1981 census data on unemployment, overcrowding, and social class of head of household. The scores were grouped into quintiles, with a small sixth category for unclassifiable enumeration districts, mostly with institutional populations. According to this deprivation score, the areas closer to the transmitter were more affluent than those further away, i.e., at 1–2 km, 67 percent of the population was in the two most affluent

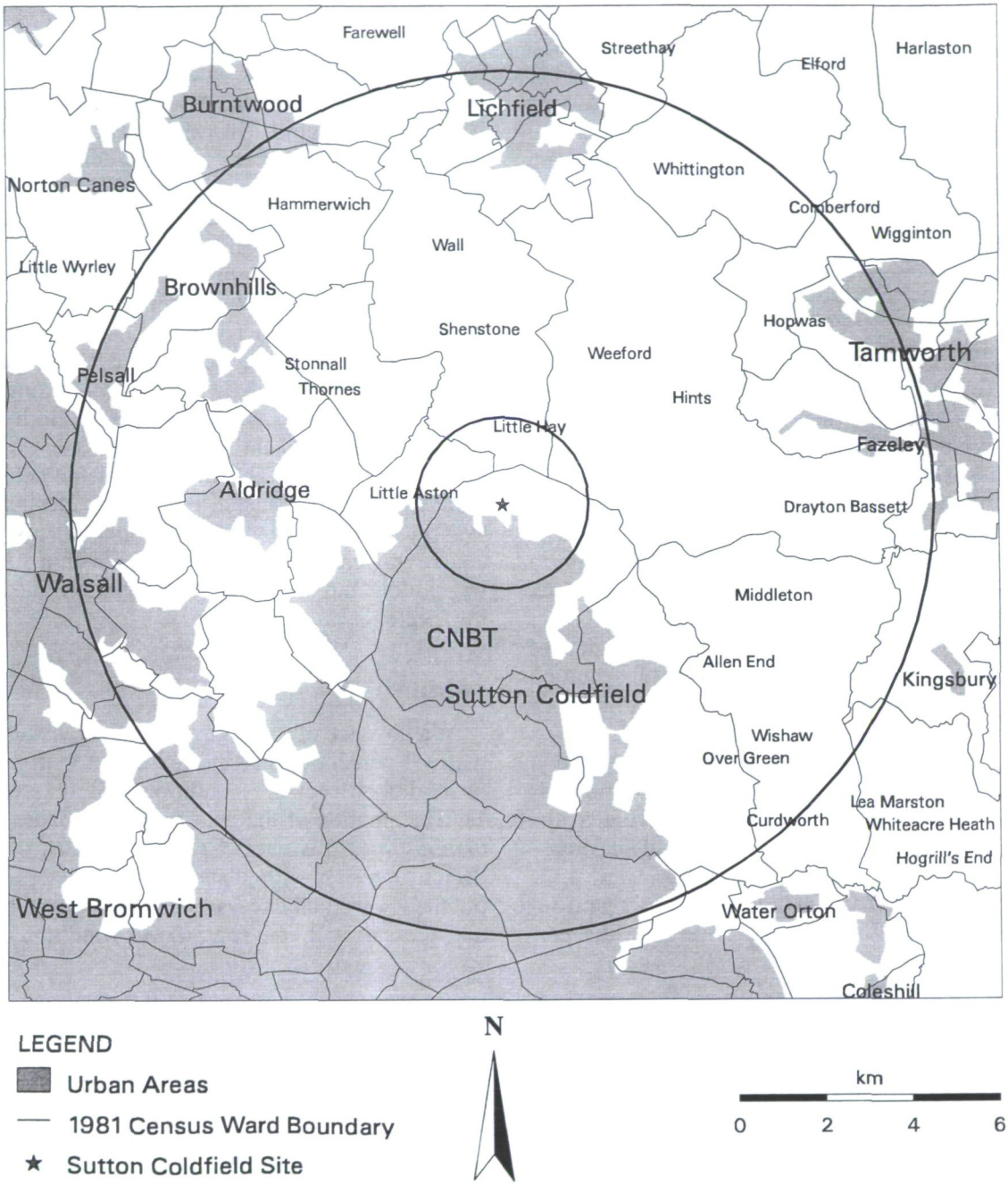

FIGURE 1. Map of 2 and 10 km circles surrounding Sutton Coldfield television and FM radio transmitter, showing position of census ward "CNBT." (Map data copyright Automobile Association.)

quintiles, compared with 28 percent at 9.2–10 km. For many cancers (e.g., lung), lower incidence rates would be expected in the more affluent areas; for some other cancers (e.g., leukemia), there is essentially no relation between incidence and deprivation thus measured, whereas for others (e.g., skin melanoma), higher disease rates are found in the more affluent areas (24).

Statistical analysis was based on the comparison of observed and expected numbers of cancer cases; the expected numbers were calculated from national incidence rates stratified by 5-year age group, sex, year, and deprivation quintile, and regionally adjusted, as described in detail elsewhere (25). Compared with national rates, the West Midlands region had standardized incidence ratios of 0.95 for all cancers and 0.80 for leukemias (0.65 for chronic lymphatic leukemia).

For descriptive purposes, observed and expected values, observed/expected (O/E) ratios, and their 95

percent confidence intervals (calculated assuming a Poisson distribution) are reported for the entire study area (0–10 km) and for an area close to the source, arbitrarily chosen to be 0–2 km. Formal tests of significance were based on those proposed by Stone (26) for isotonic decline in risk with distance from the source. These tests give due weight to the smaller populations near the site, and do not prespecify the shape of the decline, or boundaries between "exposed" and "unexposed" populations. Both an unconditional and a conditional test were performed (25, 27, 28). For the unconditional test, the null hypothesis is that the relative risk is one in each of the bands. An isotonic alternative includes any pattern of non-increasing risk over the study area. The data were further explored by use of the conditional test that corrects for the overall level of risk over the 10 km study area, thereby specifying a null hypothesis where all relative risks are equal to a constant, not necessarily one (25, 27). Significance levels were obtained by Monte Carlo methods based on 999 simulations and the nominal statistical significance level taken to be $p = 0.05$. Stone's tests were in all cases performed on the data in the ten predefined distance bands. For presentation purposes only, we give some data collapsed into four distance bands.

A geographic analysis to investigate the background variability of leukemia incidence in the West Midlands region was also done, in order to place in context the size of any excess found in the vicinity of the transmitter. This analysis was done at census ward level relating to around 10,000 people on average and included supplementary postcoding to reduce the percentage of unpostcoded cases of leukemias from 2.5 percent to 0.3 percent. Observed and expected numbers per ward were calculated as for the main analysis. Departure from Poisson variability was tested by the Pothoff-Whittinghill test (29) and a 5th to 95th percentile range in O/E ratios was calculated using a likelihood method that removes the random component of variability (30). O/E ratios were "smoothed" using an empirical Bayesian method (31). This method produces a set of smoothed estimates on the basis of a compromise between the observed relative risks and the overall regional mean, with the amount of "shrinkage to the mean" being determined by the population size of each ward, thereby removing variability in O/E ratios due to small population sizes. Both raw and smoothed values of the O/E ratio for each of the 832 wards were ranked, and the rank of the census ward containing the transmitter (ward designated as "CNBT" in figure 1) was determined. This ward included 90 percent of the population within 2 km of the transmitter, but with half its population outside the 2 km circle.

RESULTS

At a distance of 0–10 km from the transmitter, there was a 3 percent excess in all cancers with significant unconditional but not conditional Stone's test (table 1). Examination of the data for all ten bands (table 2) demonstrates this overall excess but lack of trend of decreasing risk with distance. Non-Hodgkin's lymphoma showed an excess from 0–10 km (table 1) but no excess at 0–2 km. The Stone's conditional test and

TABLE 1. Selected cancers near the Sutton Coldfield transmitter, West Midlands, England: observed and expected numbers of cases, observed/expected (O/E) ratios, and 95% confidence intervals (CI), by distance of residence from transmitter, in persons aged ≥15 years, 1974–1986

Type of cancer	Distance from transmitter (km)								Stone's *p* value*	
	0–2				0–10					
	Observed	Expected	O/E ratio	95% CI	Observed	Expected	O/E ratio	95% CI	U	C
All cancers†	703	647.49	1.09	1.01–1.17	17,409	16,861.22	1.03	1.02–1.05	0.001	0.462
Hematopoietic and lymphatic	45	37.08	1.21	0.91–1.62	935	895.83	1.04	0.98–1.11	0.153	
All leukemias and non-Hodgkin's lymphomas	31	24.76	1.25	0.88–1.78	661	592.84	1.11	1.03–1.20	0.018	0.161
All leukemias	23	12.59	1.83	1.22–2.74	304	302.34	1.01	0.90–1.13	0.001	0.001
All acute	10	5.38	1.86	0.89–3.42	116	131.75	0.88	0.73–1.06	0.003	0.004
Acute myeloid	4	3.94	1.02	0.28–2.60	81	95.60	0.85	0.68–1.05	0.024	0.045
Acute lymphatic	3	0.84	3.57	0.74–10.43	21	20.62	1.02	0.67–1.56	0.201	
Chronic myeloid	2	1.63	1.23	0.15–4.43	42	39.95	1.05	0.78–1.42	0.257	
Chronic lymphatic	8	3.12	2.56	1.11–5.05	96	72.56	1.32	1.08–1.62	0.002	0.007
Non-Hodgkin's lymphomas	8	12.17	0.66	0.28–1.30	357	290.50	1.23	1.11–1.36	0.005	0.958
Multiple myeloma	10	6.51	1.54	0.74–2.83	174	154.52	1.13	0.97–1.31	0.156	

* *p* values given by Stone's unconditional (U) and conditional (C) tests.
† All cancers excluding non-melanoma skin cancer.

TABLE 2. All cancers, all leukemias, and non-Hodgkin's lymphomas near the Sutton Coldfield transmitter, West Midlands, England: observed and expected numbers of cases, observed/expected (O/E) ratios, and cumulative O/E ratios, by distance of residence from transmitter, in persons aged ≥15 years, 1974–1986

Distance from transmitter (km)	All cancers*				All leukemias				Non-Hodgkin's lymphomas			
	Observed	Expected	O/E ratio	Cumulative O/E ratio	Observed	Expected	O/E ratio	Cumulative O/E ratio	Observed	Expected	O/E ratio	Cumulative O/E ratio
0–0.5	2	5.61	0.36	0.36	1	0.11	9.09	9.09	0	0.11	0.00	0.00
0.5–1.0	96	137.19	0.70	0.69	5	2.72	1.84	2.12	3	2.60	1.15	1.11
1.0–2.0	605	504.59	1.20	1.09	17	9.76	1.74	1.83	5	9.46	0.53	0.66
2.0–3.0	282	279.01	1.01	1.08	9	5.56	1.62	1.76	9	5.76	1.56	0.95
3.0–4.9	1,002	1,050.86	0.95	1.00	25	20.22	1.24	1.49	20	20.25	0.99	0.97
4.9–6.3	2,414	2,301.25	1.05	1.03	54	41.96	1.29	1.38	45	40.60	1.11	1.04
6.3–7.4	2,734	2,650.62	1.03	1.03	48	46.54	1.03	1.25	57	43.95	1.30	1.13
7.4–8.3	2,827	2,798.65	1.01	1.02	51	49.22	1.04	1.19	52	47.19	1.10	1.12
8.3–9.2	3,363	3,213.75	1.05	1.03	40	57.35	0.70	1.07	80	54.56	1.47	1.21
9.2–10	4,084	3,919.59	1.04	1.03	54	68.90	0.78	1.01	86	66.02	1.30	1.23

* All cancers excluding non-melanoma skin cancer.

examination of the data over the ten bands (table 2) do not indicate a decline in risk with distance. Excesses within 2 or 10 km of the transmitter for hematopoietic and lymphatic cancers and multiple myeloma, were not statistically significant (table 1), nor was there evidence of a significant decline in risk with distance.

For adult leukemias from 0–2 km, the O/E ratio was 1.83 (95 percent confidence interval (CI) 1.22–2.74), based on 23 cases (table 1). The Stone's tests indicated a significant ($p = 0.001$) decline in risk with distance; data for all ten bands (table 2) were consistent with a decline in risk extending over the entire 10 km. Risk fell below 1.0 in the outer bands so that there was no overall excess over the 10 km area (O/E ratio = 1.01, 95 percent CI 0.90–1.13) (table 1). A pattern of decline with significant Stone's conditional tests was also found at ages 15–64 and ≥65 years, and for each sex separately (table 3). Acute leukemias, acute myeloid leukemia, and chronic lymphatic leukemia showed significant declines in risk with distance, as indicated by Stone's tests (table 1) and inspection of the data (table 4).

The leukemia excess at 0–2 km was apparent in both the earlier (1974–1980) and later (1981–1986) periods; there were 11 leukemia cases in the first period and 12 leukemia cases in the second period, and O/E ratios of 1.80 and 1.85, respectively. Stone's tests were significant in both periods. Twenty-one of the 23 cases within 2 km are known to have died, as verified by death certificates, and all but one had died by 1988. The stated occupations at diagnosis of the 23 adult leukemia cases were as follows: of 10 females, 4 housewives, 1 clerk/cashier, and 5 unstated; of 13 males, 2 clerk/cashiers, 3 managers, 1 printer, 1 gardener, 1 teacher, 1 farmer, 1 driver/foreman of roads goods vehicles, 1 inadequately described, and 2 unstated.

Among children, there were 97 cancers within 0–10 km of the transmitter (106.1 expected), including 34 leukemia cases (29.7 expected), of which 2 cases were at 0–2 km (1.1 expected); Stone's tests were not significant (leukemia conditional test $p = 0.173$).

Among other adult cancers, there was a significant decline in risk for skin melanoma and for bladder

TABLE 3. Leukemia near the Sutton Coldfield transmitter, West Midlands, England, by age and sex: observed and expected numbers of cases, observed/expected (O/E) ratios, and 95% confidence intervals (CI), by distance of residence from transmitter, in persons aged ≥15 years, 1974–1986

Sex and age (years)	Distance from transmitter (km)								Stone's p value*	
	0–2				0–10					
	Observed	Expected	O/E ratio	95% CI	Observed	Expected	O/E ratio	95% CI	U	C
Both sexes										
15–64	10	4.75	2.11	1.01–3.87	132	121.71	1.08	0.91–1.29	0.003	0.001
≥65	13	7.84	1.66	0.97–2.84	172	180.63	0.95	0.82–1.11	0.009	0.008
Males										
≥15	13	6.72	1.93	1.13–3.31	162	164.72	0.98	0.84–1.15	0.002	0.000
Females										
≥15	10	5.86	1.71	0.82–3.14	142	137.60	1.03	0.88–1.22	0.014	0.006

* p values given by Stone's unconditional (U) and conditional (C) tests.

TABLE 4. Acute leukemias and acute myeloid, acute lymphatic, chronic myeloid, and chronic lymphatic leukemias near the Sutton Coldfield transmitter, West Midlands, England: observed numbers of cases and observed/expected (O/E) ratios, by distance of residence from transmitter, in persons aged ≥15 years, 1974–1986

Leukemia subtype	Distance from transmitter (km)							
	0–2		2–4.9		4.9–7.4		7.4–10	
	Observed	O/E ratio	Observed	O/E ratio	Observed	O/E ratio	Observed	O/E ratio
Acute leukemias	10	1.86	11	0.95	38	0.99	57	0.75
Acute myeloid	4	1.02	8	0.97	28	1.00	41	0.74
Acute lymphatic	3	3.57	3	1.52	5	0.83	10	0.85
Chronic myeloid	2	1.23	3	0.87	19	1.62	18	0.78
Chronic lymphatic	8	2.56	14	2.31	27	1.27	47	1.12

cancer (table 5), although point estimates of O/E ratios were not in excess within 1 km for these cancers (table 6); none of the other Stone's tests were significant.

The ward level geographic analysis of adult leukemia in the West Midlands region showed significant extra-Poisson variability (Pothoff-Whittinghill $z = 2.67$, $p = 0.004$). The 5th to 95th percentile range of O/E ratios was estimated as 0.70 to 1.35 after removing random fluctuation. Census ward "CNBT," containing 90 percent of the population within 2 km of the transmitter, had a raw O/E ratio of 1.55, which ranked 154 out of 832 wards. After smoothing, the ratio was 1.25, ranking second. The highest ranking ward for smoothed values had 26 observed cases and a raw O/E ratio of 1.74, which after smoothing was reduced to 1.26. This analysis therefore indicates that the excess in the 0–2 km circle around Sutton Coldfield, with 23 cases observed and 12.6 expected, was unusual, even in the presence of significant geographic variation in leukemia incidence in the West Midlands region. However, the magnitude of excess was not much greater than that found elsewhere in the region.

DISCUSSION

The main finding was the confirmation of a reported excess of leukemias near the Sutton Coldfield radio and television transmitter, and a decline in risk with distance from the site. Because all but one of the leukemia cases included in our study had died by 1988, this would seem to be independent of the seven apparently current cases reported in the media in 1992, although unfortunately further details of those cases were not made available to us or to the health authorities. Our findings appear to be consistent over two independent time periods (1974–1980 and 1981–

TABLE 5. Other cancers near the Sutton Coldfield transmitter, West Midlands, England: observed and expected numbers of cases, observed/expected (O/E) ratios, and 95% confidence intervals (CI), by distance of residence from transmitter, in persons aged ≥15 years, 1974–1986

Type of cancer	Distance from transmitter (km)								Stone's *p* value*	
	0–2				0–10					
	Observed	Expected	O/E ratio	95% CI	Observed	Expected	O/E ratio	95% CI	U	C
Cancers possibly associated with non-ionizing radiation										
Brain										
Malignant and benign	17	13.20	1.29	0.80–2.06	332	317.74	1.04	0.94–1.16	0.612	
Malignant	12	9.18	1.31	0.75–2.29	218	223.27	0.98	0.86–1.11	0.717	
Skin melanoma	13	9.10	1.43	0.83–2.44	189	196.53	0.96	0.83–1.11	0.027	0.018
Eye melanoma	0	0.71	0	0–4.22	20	17.19	1.16	0.75–1.80	0.849	
Male breast	1	0.61	1.64	0.04–9.13	15	15.08	0.99	0.60–1.64	0.889	
Common cancers										
Female breast	107	98.67	1.08	0.90–1.31	2,412	2,288.30	1.05	1.01–1.10	0.131	
Lung	113	112.31	1.01	0.84–1.21	3,466	3,418.60	1.01	0.98–1.05	0.875	
Colorectal	112	99.48	1.13	0.94–1.35	2,529	2,454.93	1.03	0.99–1.07	0.330	
Stomach	33	43.75	0.75	0.54–1.06	1,326	1,248.40	1.06	1.01–1.12	0.246	
Prostate	37	32.81	1.13	0.82–1.55	785	760.45	1.03	0.96–1.11	0.466	
Bladder	43	28.37	1.52	1.13–2.04	788	728.96	1.08	1.01–1.16	0.008	0.040

* *p* values given by Stone's unconditional (U) and conditional (C) tests.

TABLE 6. Skin melanoma and bladder cancers in the vicinity of the Sutton Coldfield transmitter, West Midlands, England: observed and expected numbers of cases, observed/expected (O/E) ratios, and cumulative O/E ratios, by distance of residence from transmitter, in persons aged ≥15 years, 1974–1986

Distance from transmitter (km)	Skin melanoma				Bladder cancer			
	Observed	Expected	O/E ratio	Cumulative O/E ratio	Observed	Expected	O/E ratio	Cumulative O/E ratio
0–0.5	0	0.09	0.00	0.00	0	0.24	0.00	0.00
0.5–1.0	2	2.02	0.99	0.95	4	5.96	0.67	0.65
1.0–2.0	11	6.99	1.57	1.43	39	22.17	1.76	1.52
2.0–3.0	12	5.03	2.39	1.77	11	11.94	0.92	1.34
3.0–4.9	16	16.16	0.99	1.35	43	45.27	0.95	1.13
4.9–6.3	26	28.77	0.90	1.13	119	100.31	1.19	1.16
6.3–7.4	28	27.93	1.00	1.09	131	114.85	1.14	1.15
7.4–8.3	32	30.90	1.04	1.08	117	120.64	0.97	1.10
8.3–9.2	28	35.66	0.79	1.01	169	140.13	1.21	1.13
9.2–10	34	43.08	0.79	0.96	155	167.45	0.93	1.08

1986). Within the context of some unexplained variability in leukemia incidence across census wards in the West Midlands region, the excess near Sutton Coldfield can be considered unusual.

Possible methodological artefacts to explain the leukemia findings were explored. First, the lower registration of cancers, and particularly leukemias, in West Midlands relative to the country as a whole, is unexplained, but there was no suggestion that the level of registration varied systematically within the region; nor would it seem likely that any such registration artefact could produce local trends in risk of the order seen around Sutton Coldfield. Second, there are known problems of leukemia diagnosis and registration, particularly at older ages, but we found similar results in the younger and older age groups. Third, the study spanned 1974–1986, but relied on population data from the 1981 census, i.e., around the midpoint of the study period. Estimates were made of the extent to which population change over the period (including ageing of the population) may have led to bias in the calculation of the expected numbers of cancers. Based on data from the 1971 and 1991 censuses, there appeared to be a tendency for overestimation of the O/E ratios close to the site (within 2 km), but the bias, estimated at less than 5 percent, was not sufficient to explain the excesses of leukemia observed.

Secondary findings of the study were declines in skin melanoma and bladder cancer with distance from the transmitter site. Because skin melanoma is strongly inversely related to level of deprivation (24), and because this transmitter is located in a relatively affluent area, control for socioeconomic confounding, as expected, reduced the size of the excess—by 11 percent within 2 km. However, it is possible that further socioeconomic confounding could explain at least part of the residual excess of skin melanoma near the site. Bladder cancer was examined along with other causes to explore the small general excess in all cancers, and there was no a priori hypothesis linking it to the exposure under consideration. The results should be viewed in the context of the large number of statistical tests performed and hence may be chance findings.

Field strength measurements have been made in the vicinity of the transmitter (British Broadcasting Corporation, internal report, 1994). In general, both measured and predicted field strength values tended to show a decline in average field strength or power density with distance from the transmitter, although there are undulations in predicted field strength up to distances of about 6 km from the transmitter resulting from the vertical radiation pattern. The maximum total power density equivalent summed across frequencies at any one measurement point (at 2.5 m above ground) was 0.013 W/m^2 for TV, and 0.057 W/m^2 for FM. However, there was considerable variability between different measurement points at any one distance from the transmitter, as would be expected from the impact of reflections from the ground and buildings, and this variability was as great as that related to distance. Power density on average declines by a factor of at least 5 to 10 over 10 km. Field strength varies as the square root of power density, thus declining less steeply, and it is not clear which exposure measure would be biologically more relevant for athermal effects. These measurements cannot of course be converted to personal dose to residents, which depends on numerous factors, including building type, the amount of time spent inside the home as well as away from home, and the number of years spent at the residence. It can nevertheless be assumed that, on average, residents in higher exposure areas receive higher doses unless this is obscured by the combination of patterns

of population density and of variable field strengths at any one distance from the transmitter. The exposures near Sutton Coldfield appear to be much lower than those in other epidemiologic studies where the health effects of radiofrequency exposure have been examined (2, 13, 14, 22). They are well within current guidelines based on the thermal effects of radiofrequency exposure (15, 32).

In conclusion, the results of this study confirm that there was an excess of adult leukemia within the vicinity of the Sutton Coldfield TV/FM transmitter in the period 1974–1986, accompanied by a decline in risk with distance from the transmitter. Further monitoring of cancer statistics in the area appears warranted. No causal implications regarding radio and TV transmitters can be drawn from this finding, based as it is on a single "cluster" investigation. Results of a study of cancer incidence around all other high power radio and TV transmitters in Great Britain are given in the accompanying paper (33) in order to put the present results in wider context.

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Mobile phones and head tumours.

The discrepancies in cause-effect relationships in the epidemiological studies – how do they arise?

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Abstract

Background

Whether or not there is a relationship between use of mobile phones (analogue and digital cellulars, and cordless) and head tumour risk (brain tumours, acoustic neuromas, and salivary gland tumours) is still a matter of debate; progress requires a critical analysis of the methodological elements necessary for an impartial evaluation of contradictory studies.

Methods

A close examination of the protocols and results from all case-control and cohort studies, pooled- and meta-analyses on head tumour risk for mobile phone users was carried out, and for each study the elements necessary for evaluating its reliability were identified. In addition, new meta-analyses of the literature data were undertaken. These were limited to subjects with mobile phone latency time compatible with the progression of the examined tumours, and with analysis of the laterality of head tumour localisation corresponding to the habitual laterality of mobile phone use.

Results

Blind protocols, free from errors, bias, and financial conditioning factors, give positive results that reveal a cause-effect relationship between long-term mobile phone use or latency and statistically significant increase of ipsilateral head tumour risk, with biological plausibility. Non-blind protocols, which instead are affected by errors, bias, and financial conditioning factors, give negative results with systematic underestimate of such risk. However, also in these studies a statistically significant increase in risk of ipsilateral head tumours is quite common after more than 10 years of mobile phone use or latency. The meta-analyses , our included, examining only data on ipsilateral tumours in subjects using mobile phones since or for at least 10 years, show large and statistically significant increases in risk of ipsilateral brain gliomas and acoustic neuromas.

Conclusions

Our analysis of the literature studies and of the results from meta-analyses of the significant data alone shows an almost doubling of the risk of head tumours induced by long-term mobile phone use or latency.

DAILY EXPRESS
THE WORLD'S GREATEST NEWSPAPER

Tuesday 24th June 2008

SUICIDES 'LINKED TO PHONE MASTS'

Sunday June 22,2008

Lucy Johnston

THE spate of deaths among young people in Britain's suicide capital could be linked to radio waves from dozens of mobile phone transmitter masts near the victims' homes.

Dr Roger Coghill, who sits on a Government advisory committee on mobile radiation, has discovered that all 22 youngsters who have killed themselves in Bridgend, South Wales, over the past 18 months lived far closer than average to a mast.

He has examined worldwide studies linking proximity of masts to depression. Dr Coghill's work is likely to trigger alarm and lead to closer scrutiny of the safety of masts, which are frequently sited on public buildings such as schools and hospitals.

It is also likely to fuel more campaigns against placing masts close to public places on health grounds.

Dr Coghill said last night there was strong circumstantial evidence that the masts may have triggered depression in those from Bridgend who took their lives.

They include Kelly Stephenson, 20, who hanged herself from a shower rail in February this year while on holiday in Folkestone, Kent.

Dr Coghill said: "There is a body of research that has over the years pointed to the fact that exposure to mobile radiation can lead to depression. There is evidence of higher suicide rates where people live near any electrical equipment that gives off radio or electrical waves."

There are now 70 million mobile phone handsets in the UK and around 50,000 masts. Both emit radio signals and electromagnetic fields that can penetrate the brain, and for many years campaigners have argued that this could seriously damage people's health.

The national average for proximity to a mobile phone transmitter varies depending on the type of mast. The latest masts are far more powerful so they can transmit more sophisticated data, such as photos and videos for people to download on internet phones.

Masts are placed on average 800 metres away from each home across the country. In Bridgend the victims lived on average only 356 metres away.

The national average distance from a new powerful mast is a kilometre while in Bridgend it is 540 metres. Three transmitters were within 200 metres, 13 within 400 metres and as many as 22 within 500 metres of victims' homes. Carwyn Jones, 28, who hanged himself last week, was the third young person in his street to commit suicide.

Research shows young people's brains are more susceptible to radio wave energy. Only two weeks ago a report identified mobiles as having an effect on sleep patterns.

Dr Coghill added: "What seems to be happening is that the electrical energy is having an effect on the chemistry of the brain, depleting serotonin levels. We know that in depression serotonin levels are low and that a standard treatment for depression is to give drugs to boost serotonin levels. As they begin to work, the patient's depression lifts."

He said urgent research was needed because Britain was now covered with thousands of masts, many close to homes, schools and offices.

Since January 5, 2007, there have been 22 deaths of young people in the Bridgend area. Some believe the suicides are linked but so far experts have failed to find a common cause.

Thomas Davies, 20, hanged himself in February 2007. Last night his brother Nathan, 19, welcomed Dr Coghill's research. "As far as this family is concerned nothing can bring Tom back," he said. "But if there is a link found and something can be done then it could prevent further suicides."

But Mike Dolan, executive director of the Mobile Operators Association, dismissed Dr Coghill's research. "This is an insensitive and outrageous piece of speculation which has no basis in established science," he said.

The Government's Health Protection Agency insisted that fields from mobile masts – even modern powerful masts – were well within international agreed safety limits. "There is no evidence that masts do you harm. The levels of radio waves are very low."

This abstract is for a presentation made an international conference entitled "The Precautionary EMF Approach: Rationale, Legislation and Implementation", convened by the International Commission for Electromagnetic Safety and hosted by the City of Benevento, Italy, in February 2006,

Title: Can EMF exposure during development leave an imprint later in life?
Author: Carl F. Blackman

People in industrialized nation live in an environment of electromagnetic fields (EMF), both natural and anthropogenic. The intensity, variety, and geographic distribution of anthropogenic EMF have grown dramatically since the mid 20th century, with many uses being directed at human populations, such as electric power distribution, radio and television transmission, and more recently personal cell phone communication units and transmitting towers. It is reasonable to ask if this EMF could cause any alterations in the physiology of developing organisms, which are assumed to be the most sensitive to chemical stressors. In this report we will review work published in the late 1980s that indicates exposure to power-line electric fields at 10 V/m in air could cause changes in the brain tissue of developing chicken eggs to cause the brain tissue in the chickens hatched from those eggs to responded different in an assay, depending upon whether the incubating eggs were exposed to 50 or 60 Hz.

Furthermore, an anecdotal report of human sensitivity to EMF that shows the influence of prior exposure history to particular power-line frequencies in chemically sensitized individuals will be described. These reports open the question of whether the ambient electromagnetic environment can leave an imprint on developing organisms and if such a change has health consequences
Disclaimer: the opinions expressed here are solely those of the author, and not necessarily those of his employer.

FOR IMMEDIATE RELEASE

Research by Tamara Mareia, CCN and George Carlo, M.D., on correlation between autism, cell phones, and wireless computers

Children potentially at higher risk for autism and potentially other behavior and attention deficit disorders with rise in cell phone and wireless use.

Nashville, TN -- April 17, 2007 --

Today the incidence of autism in the United States is 1 in 150 children, according to published CDC reports, a horrific increase from the end of the 1970s, when the ratio of autism in our society was 1 in 10,000, before the cell phone, wireless and similar technologies were introduced into the environment that produce radio waves. Tamara Mariea, founder of Internal Balance™, Inc., is releasing findings from more than five years of research on clients with autism, and other membrane sensitivity disorders that point to electromagnetic radiation stress, which increases with the **proliferation of cell phone and wireless use, as one of the potentially major root causes of the explosion of autistic cases in the past two decades.** Electromagnetic radiation stress in people's lives continues to explode as radio waves in the air that carry the latest communication technology such as cell phones and wireless computers bombard our bodies.

"**My recent awareness of the research being done by Tamara Mariea, CCN with autism and EMR (Electromagnetic Radiation), suggested to me that it may be an important missing link. Since we know that electrical currents at microvolt levels in the body are of vital importance, it makes a world of sense to research the potential of electromagnetic pollution in the etiology of disease. There is no doubt that we are seeing a severe epidemic rise of autism in children and the widespread use of electronics and wireless devices may well be a factor that has been ignored," said Derrick Longsdale, M.D., F.A.A.P., F.A.C.N., CNS. Dr. Longsdale is a DAN! Protocol practicing doctor.**

Mariea's clinic receives calls from physicians around the world on a weekly basis seeking cutting edge treatments beyond traditional western medicine for their patients. Mariea is quickly becoming highly regarded with her expansive knowledge in physiological detoxification.

"My association with Tamara Mariea, CCN has been truly inspiring. She has impressive knowledge and insight into both biochemical and electromagnetic contributions to illness and healing. In particular she has opened my eyes to the potentially groundbreaking link between electromagnetic pollution and the crippling of cellular detoxification. This may play a central role in autism as well as chronic illness of all types in all ages," said Stephen L. Reisman, M.D.

The Safe Wireless Initiative (SWI) based in Washington, D.C. has just appointed Mariea Director of Clinical Protocol Development and a member of its Board of Directors. Dr. George Carlo, world-renown scientist, epidemiologist and attorney, is the founder of the Institute. He and Mariea have worked closely for the past year to help educate those on the front line of treating disorders regarding the hazards of electromagnetic radiation on people.

"I am proud to have my research and clinical data presented by Dr. Carlo as he lectures throughout the United States and Europe. We are working together on the front-lines of one of the greatest public safety issues to ever confront our children," says Mariea.

For the past five years at the Internal Balance Inc., clinic, Mariea and her staff have been tracking and collecting clinical data that measures the heavy metal excretion patterns in children with autism. Clients who have traveled from across America to Tennessee have been detoxified in an **electromagnetic radiation clean environment at the**

clinic with remarkable results. In 2005 she began controlling the environment in which her clients were treated. It was then, with the electromagnetic radiation mitigated environment that she began to see increased levels of heavy metal excretion.

She has addressed electrical pollution from a direct magnetic effect on the body as it relates to dirty power as well as electro magnetic radiation (EMR) created from cell phones, computers, radios, cell phone towers, etc.

This toxic pollution entering the body is created from transmitting data as information carrying radio waves. Mariea's research has validated a direct biological effect on the cell membrane discovered by Dr. George Carlo. She has developed therapeutic interventions to detoxify these trapped toxins from the body.

Mariea's soon to be published paper will include her research which explores electromagnetic radiation as a cohort effect with heavy metals as a strong component of the etiology of autism.

In simple terms, Mariea explains to parents struggling to help their children that what her research is pointing to is with more cell phone towers being erected, more cell phones in use globally and more WiFi technology utilized, the risk for autism continues to rise. She says that Thimerosal (the mercury containing preservative in scheduled children's vaccines has for the most part been eliminated from regularly scheduled childhood vaccines, according to public record and that the incidence of autism should be decreasing based on progress made in that area in recent years. But, it is not decreasing, she says. This is where Mariea and Dr. Carlo began to collaborate in the search to find what the larger contributor to the increase in autism is. The epidemiologic curve of autism parallels too closely with the increase usage of wireless devices to not look at it.

"My son is currently 11 years old and we have been researching and utilizing many types of biomedical services since Michael was four years old. We have chelated, detoxified, and supplemented with many different types of nutrients. This has been in addition to all the other traditional recommended therapies for autism, such as OT, ABA and Speech Therapy. One of the most important discoveries in the last seven years that has made a dramatic impact toward my son's recovery was the realization that Michael was severely sensitive to EMR. Not only was he sensitive, but it was holding his body hostage from freeing toxic heavy metals. In addition, every time Michael was in the car with me while I was on a cell phone, he would literally flip out. I did not realize until Tamara educated me that I was radiating my son's body with EMR. After looking at the impact that EMR had on his neurochemistry it made terrific sense. We have implemented the strategies suggested by Tamara and we are moving faster toward his recovery than ever," said Bob Claeys, father of Michael, a client.

Mariea has a Degree in Biology/Biochemistry from Bowling Green State University and her Post-Graduate work in Human Clinical Nutrition. She is a Certified Clinical Nutritionist and detoxification specialist. She has been conducting research and providing strategic interventions in the field of nutrition and detoxification for more than a decade. Tamara has also developed highly respected Nutrition Detox and Performance Programs for many top professional athletes including well-known professional **MBL player JD Drew and NBA player Allan Houston.**

For more information about autism, **safety measures when using a cell phone, or wireless technology and Mariea's work, visit www.internalbalance.com. There are many wonderful websites to educate parents about Autism, a few of them include www.autismone.org, www.autism-society.org or www.defeatautismnow.org, www.autismspeaks.org, www.safeminds.org, and www.evidenceofharm.com. For more information about the harmful effects of cell phones and WiFi use, visit www.safewireless.org and www.yourkidscellphone.com.**

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Review

Exposure to electromagnetic fields (non-ionizing radiation) and its relationship with childhood leukemia: A systematic review

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ABSTRACT

Childhood exposure to physical contamination, including non-ionizing radiation, has been implicated in numerous diseases, raising concerns about the widespread and increasing sources of exposure to this type of radiation. The primary objective of this review was to analyze the current state of knowledge on the association between environmental exposure to non-ionizing radiation and the risk of childhood leukemia. Scientific publications between 1979 and 2008 that include examination of this association have been reviewed using the MEDLINE/PubMed database. Studies to date have not convincingly confirmed or ruled out an association between non-ionizing radiation and the risk of childhood leukemia. Discrepancies among the conclusions of the studies may also be influenced by confounding factors, selection bias, and misclassification. Childhood defects can result from genetic or epigenetic damage and from effects on the embryo or fetus, which may both be related to environmental exposure of the parent before conception or during the pregnancy. It is therefore critical for researchers to define *a priori* the type and "window" of exposure to be assessed. Methodological problems to be solved include the proper diagnostic classification of individuals and the estimated exposure to non-ionizing radiation, which may act through various mechanisms of action. There appears to be an urgent need to reconsider exposure limits for low frequency and static magnetic fields, based on combined experimental and epidemiological research into the relationship between exposure to non-ionizing radiation and adverse human health effects.

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1. Introduction

Humans have been constantly exposed to electromagnetic radiation, including sunlight, cosmic rays, and terrestrial radiations. However, a substantial increase in exposure, especially to low-frequency electromagnetic radiation (EMR), started in the early

Abbreviations: AML, acute myeloid leukemia; ALL, acute lymphoid leukemia; EMR, electromagnetic radiation; ELF-EMR, extremely low-frequency electromagnetic radiation; ICNIRP, International Council of Non-Ionizing Radiation Protection; NIR, non-ionizing radiation; LF-EMR, low-frequency electromagnetic radiation; RF, radio frequencies.

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Mobile Phone Use and Risk of Tumors: A Meta-Analysis

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Abstract

Purpose Case-control studies have reported inconsistent findings regarding the association between mobile phone use and tumor risk. We investigated these associations using a meta-analysis.

Methods We searched MEDLINE (PubMed), EMBASE, and the Cochrane Library in August 2008. Two evaluators independently reviewed and selected articles based on predetermined selection criteria.

Results Of 465 articles meeting our initial criteria, 23 case-control studies, which involved 37,916 participants (12,344 patient cases and 25,572 controls), were included in the final analyses. Compared with never or rarely having used a mobile phone, the odds ratio for overall use was 0.98 for malignant and benign tumors (95% CI, 0.89 to 1.07) in a random-effects meta-analysis of all 23 studies. However, a significant positive association (harmful effect) was observed in a random-effects meta-analysis of eight studies using blinding, whereas a significant negative association (protective effect) was observed in a fixed-effects meta-analysis of 15 studies not using blinding. Mobile phone use of 10 years or longer was associated with a risk of tumors in 13 studies reporting this association (odds ratio = 1.18; 95% CI, 1.04 to 1.34). Further, these findings were also observed in the subgroup analyses by methodologic quality of study. Blinding and methodologic quality of study were strongly associated with the research group.

Conclusion The current study found that there is possible evidence linking mobile phone use to an increased risk of tumors from a meta-analysis of low-biased case-control studies. Prospective cohort studies providing a higher level of evidence are needed.

Footnotes

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Cell Phone Research and Tips for Safety

By Jacqueline Fields, MD and founder of Dr. Fields' Sacred Skin | November 2014

1. Buy a low-radiation phone.

When you pick up your phone and make a call, that call is transmitted and received via the phenomena of electromagnetic waves.

In 2009, it was estimated that more than 4 billion people used cell phone technology (ITU 2009). However, because this technology has only been around for about twenty years, scientists do not fully understand the repercussions and long-term risks associated with cell phone radiation emissions.

As time passes, newer and more advanced phones, such as the more popular smartphone models, are being developed with increasing degrees of cell phone radiation emissions. The Environmental Working Group, a team of scientists, educators, engineers, and lawyers, is a public health lobby group that gets quite a bit done in United States legislature by making little known public health concerns more public. Consult their buyer's guide for a low-emission phone and consider replacing yours with one that they recommend. EWG Buyer's Guide: http://www.ewg.org/cellphoneradiation/Get-a-Safer-Phone

2. Choose texting over talking.

Research has confirmed that during transmission time, a considerable amount of radiation travels inward toward the ear and head of the cell phone user.

Several recent studies show a correlation between cell phone radiation emission and conditions involving the brain or within the region of the head. EWG reports that:

•Brain Cancer: Two analyses of 25 original publications identified a 50-90% increase in risk for two types of brain tumors: glioma and acoustic neuroma (Hardell 2009, Kundi 2009).
•Salivary Gland Tumors: An Israeli study found an increased risk of 50-60% for salivary gland tumors among people with the highest cell phone use (Sadetzki 2008).
•Behavioral Problems: A study of 13,159 Danish children showed an 80% elevated risk for emotional and hyperactivity problems among young children who used cell

phones and whose mothers also used cell phones during pregnancy (Divan 2008).
•Migraines and Vertigo: A study of 420,095 Danish adults showed that long-term cell phone users were 10-20% more likely to be hospitalized for migraines and vertigo than people who took up cell phones more recently (Schuz 2009).

3. Use a headset or speaker. Keep the phone away from the body.

Of the total radiation emitted towards the head, 97-99% is absorbed into the brain hemisphere on the side where the cell phone is used. Which area receives the highest radiation exposure? The temporal lobe. This area is involved in hearing, auditory processing, formation of long-term memory, speech, and vision (Cardis 2008).
If a phone is worn near the waist, as is often the case when a headset is used, the outgoing radiation is absorbed by the soft tissue located there and could also cause health issues (Agarwal 2009; Swiss Federal Office of Public Health 2009c; Whittow 2008).

The latest research is still in debate on whether wireless or corded headsets are better for your health.

Recently, a wireless tube headset device was developed. It uses a patented sound delivery process that allows sound to travel through an air-filled wireless tube. There are a few manufacturers that use this technology, and an online search will give you several options for a retail outlet.

4. Use only when there is a strong signal.

The base station, or cell phone tower, and the physical objects between the cell phone and the base station, largely affect cell phone transmissions. In order to overcome these physical objects and distance, a cell phone will transmit at a greater power. An extreme, though common, example is a rural area that has few cell towers. Cell phone use in these areas requires transmission at a greater power, meaning stronger cell phone emissions.
If signal bars are low on your cell phone, wait to use your phone until you have a stronger signal.

Note: Radiation shields, such as antenna caps or keypad covers, actually create an interference, reduce the connection quality, and force the phone to transmit at a higher power with higher radiation.

A radiation shield is not the same as hologram-encoded devices that neutralize electromagnetic waves.

5. Limit your child's phone use.

Just say no to letting your child talk on a cell phone! A Swedish study has confirmed that there is the highest risk of brain tumors among people who began using cell phones in adolescence.

The research surrounding children and health risks associated with cell phone use is staggering - mainly because cell phone emissions are particularly hazardous to young children, and yet the market is ever-growing toward this generation. The basic idea with children and their parents is that cell phone use is easy and mobile, and therefore a great "safety" tool. This is true if used only in emergency situations and by also following safety guidelines.

•Research by France Telecom scientists showed that under standard conditions of use, twice as much cell phone radiation would penetrate a child's thinner, softer skull than an adult's.
•These results confirm earlier findings, from 1996 and 2002, that a child's head absorbs more radiofrequency radiation than an adult.
•A 2008 study of 13,159 Danish children showed that young children who use cell phones and whose mothers also used cell phones during pregnancy are 80% more likely to suffer from emotional and hyperactivity problems.
•Multiple studies reported that the brains of young children absorb more radiation than those of adults, making them more susceptible to brain tumors.
•Researchers in Sweden found the highest risk of brain tumors among people who started using cell phones during adolescence (Divan 2008; Gandhi 1996; Hardell 2009; Kang 2002; Martinez-Burdalo 2004; NRC 2008b; de Salles 2006; Wang 2003; Wiart 2008).
•Health agencies in six nations have recommended reducing children's exposure to cell phone radiation: France, Germany, Israel, Switzerland, and United Kingdom.
•In 2008, European Parliament passed a resolution that urged members to develop lower cell phone radiation emission limits. Legislation introduced in the French Senate would ban marketing and sales of phones for children under 6 years old.
Children are more sensitive to cell phone radiation emissions than adults because their bone tissue is less dense. Additionally, the brain of a child is still developing, and its nervous tissue can absorb a greater amount of radiation than an adult.
In a nutshell: keep your kids away from cell phones. If you are pregnant, considering eliminating cell phone use.

Dietary steps that help mitigate exposure to cell phone emissions.
What you eat actually can help alleviate some of the stress put on the body from electromagnetic waves. These foods protect against oxidation:
•Foods rich in Vitamin C (ascorbic acid) and Vitamin E (tocopherals).

•Glutathione, another antioxidant, and herbs, such as cordyceps, which promotes the glutathione recycling process.
•Polyphenol antioxidants. These are phytochemical-bearing foods, such as green tea, Body Ecology grains, most berries, green apples, broccoli, cabbage, celery, and parsley.
•Vitality SuperGreen is an excellent source of polyphenol antioxidants, which have additionally been fermented.
•Probiotic Beverages. Beneficial bacteria used in the fermentation process are naturally found in a healthy gut. These microbes modulate the immune system, break down toxins and carcinogens, create micronutrients and prevent pathogenic bacteria from taking up residence, and help defend the body against oxidative stress.

What To Remember Most About This Article:

The research surrounding cell phone use is shocking, to say the least. New smartphones are now being developed with increased degrees of cell phone radiation emissions. Here are 5 simple tips that you can use to protect the health of you and your family when it comes to wireless communication:
1.Buy a low radiation cell phone.
2.Text instead of talk as often as possible.
3.Use speakerphone or a headset, and keep your phone away from your body.
4.Only use your phone if you have a strong signal.
5.Limit your child's cell phone use.
This last tip is especially important since almost two times as much cell phone radiation can penetrate a child's thinner, softer skull as opposed to an adult's to cause serious health risks in the future.

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NEW FEDERAL LAW SUPERSEDES LOCAL "PROTECTIVE" TELECOM ORDINANCES

Written by admin on May 11, 2012 in Events, Meetings, News

May 11, 2012
As you may know, our Santa Fe City Council, our Assistant City Attorney, Kelley A. Brennan, our Presidents of the Neighborhood Associations, and FCC Specialist Andrew Campanelli, provided by DOCTORS W.A.R. N., all worked hard to pass a more protective TeleCom Ordinance November 25, 2011.

Across the US, such groups are alarmed that when Obama signed the the Middle Class Tax Relief & Job Creation Act, it contained a sneaky clause #6409 empowering cellphone companies to ramp up radiation/power levels beyond local ordinance levels and to rent out space on towers to multiple antennas upon all pre-existing wireless installations (antennas or towers)– and local community governments cannot stop it.

Although each cell tower has FCC limitations on radiation emitted, each additional antenna is allowed the same level again. So a tower bearing four antennas–for AT & T, Sprint, Verizon, Cricket, etc. –can have four times higher levels of radiation than is the legal limit. But with #6409, there is no upper limit of radiation or limit of ugly antennas.

That is, our elected representatives–from our City Councils to our State Legislatures–are superseded by this new, unpublicized federal law. All the attempts of City and State elected officials across the US to protect their communities from the well-documented health dangers of microwave radiation emitted by cellphone towers — all rendered void by this law.
Section 6409 (Wireless Facilities Deployment) of the Middle Class Tax Relief and Job Creation Act of 2012 For a very useful legal blog that covers this new Act in great detail:

http://towerlawupdate.blogspot.com/2012/02/section-6409-wireless-facilities.html

DOCTORS W.A.R.N. (Wireless And Radiation Network), a group of ninety-plus medical and health care professionals in Santa Fe, aided in providing additional support to the City of Santa Fe in creation of their new TeleCom Ordinance. DOCTORS W.A.R.N. also supports HM 32, passed by Rep. Brian Egolf which mandated that the New Mexico Department of Health examine the current peer-reviewed, journal published research on the health dangers of EMF/EMR, cellphone towers, and cell phones and provide their Report of findings to the New Mexico Legislature November 1, 2011. The report has never been released.

Cell Phone Towers: How Far is Safe?

by Taraka Serrano

If you or people you know live within a quarter mile of a cell phone tower, this may be of concern. Two studies, one in Germany and the other in Israel, reveal that living in proximity of a cell phone tower or antenna could put your health at significant risk.

German study: 3 times increased cancer risk

Several doctors living in Southern Germany city of Naila conducted a study to assess the risk of mobile phone radiation. Their researh examined whether population living close to two transmitter antennas installed in 1993 and 1997 in Naila had increased risk of cancer.

Data was gathered from nearly 1,000 patients who had been residing at the same address during the entire observation period of 10 years. The social differences are small, with no ethnic diversity. There is no heavy industry, and in the inner area there are neither high voltage cable nor electric trains. The average ages of the residents are similar in both the inner and outer areas.

What they found is quite telling: the proportion of newly developed cancer cases was three times higher among those who had lived during the past ten years at a distance of up to 400m (about 1300 feet) from the cellular transmitter site, compared to those living further away. They also revealed that the patients fell ill on average 8 years earlier.

Computer simulation and measurements used in the study both show that radiation in the inner area (within 400m) is 100 times higher compared to the outer area, mainly due to additional emissions coming from the secondary lobes of the transmitter.

Looking at only the first 5 years, there was no significant increased risk of getting cancer in the inner area. However, for the period 1999 to 2004, the odds ratio for getting cancer was 3.38 in the inner area compared to the outer area. Breast cancer topped the list, with an average age of 50.8 year compared with 69.9 years in the outer area, but cancers of the prostate, pancreas, bowel, skin melanoma, lung and blood cancer were all increased

Israel study: fourfold cancer risk

Another study, this one from Israel's Tel Aviv University, examined 622 people living near a cell-phone transmitter station for 3-7 years who were patients in one clinic in Netanya and compared them against 1,222 control patients from a nearby clinic. Participants were very closely matched in environment, workplace and occupational characteristics. The people in the first group live within a half circle of 350m (1148 feet) radius from the transmitter, which came into service in July 1996.

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The results were startling. Out of the 622 exposed patients, 8 cases of different kinds of cancer were diagnosed in a period of just one year (July 1997 to June 1998): 3 cases of breast cancer, one of ovarian cancer, lung cancer, Hodgkin's disease (cancer of the lymphatic system), osteoid osteoma (bone tumour) and kidney cancer. This compares with 2 per 1 222 in the matched controls of the nearby clinic. The relative risk of cancer was 4.15 for those living near the cell-phone transmitter compared with the entire population of Israel.

Women were more susceptible. As seven out of eight cancer cases were women, the relative cancer rates for females were 10.5 for those living near the transmitter station and 0.6 for the controls relative for the whole town of Netanya. One year after the close of the study, 8 new cases of cancer were diagnosed in the microwave exposed area and two in the control area.

Locate the Cell Phone Towers and Antennas Near You

Do you know how many cell phone transmitters are in your neighborhood? You'd be surprised. Visit antennasearch.com to find out where the towers and antennas are in your area and how close they are to your home or place of work. The site will also pinpoint future tower locations, additional helpful information for those considering buying a home.

For clarity, towers are tall structures where antennas are installed. A typical tower may easily hold over 10 antennas for various companies. Antennas, on the other hand, are the actual emitters of signals for various radio services including cellular, paging and others. Antennas are placed on high towers or can be installed by themselves (stand alone) on top of buildings and other structures.

Using where I live as an example, I've located 3 cell phone towers and 22 antennas within a quarter mile from our home, with the closest one at 845 feet.. And this is in a relatively quiet residential neighborhood by the ocean in the small city of Hilo in Hawaii. As you may guess, I did my research only well after we've moved in. Fortunately, we're here on just a lease and we'll be a bit wiser next time we look for a new home.

What to Do If You Live Near a Cell Phone Transmitter

Short of relocating, there are some things you can do to fight the effects of electromagnetic radiation (EMR). The Safe Wireless Initiative of the Science and Public Policy Institute in Washington, DC, outlines three levels of intervention in accordance with the public health paradigm that everyone can apply. Here are our suggestions based on these guidelines:

The primary means of intervention is through avoidance or minimizing exposure. This simply means to avoid contact with EMR as much as possible. In case of a cell phone tower close to your home, this could mean using specially formulated RF shield paint, shielding fabric, shielding glass or film for windows, etc. Although they may sound extreme, these measures are a life-saver for someone who suffers from electrosensitivity, a condition in which a person experiences physical symptoms aggravated by electromagnetic fields. (Sweden is the only country so far that recognizes electrosensitivity as a real medical condition, and their government pays for measures to reduce exposure in their homes and workplaces).

The secondary means of intervention is to minimize the effects of exposure. This includes the use of bioenergetic devices that help reduce the effects of EMR, such as pendants, chips or other devices designed to strengthen the biofield of the individual. A biofield is the matrix of weak electromagnetic signals that the body's cells use to communicate with each other. EMR disrupts these signals, causing the cells to eventually shut down and result in build up of toxins and waste products within the cells, including free radicals known to result in cellular dysfunction and interference with DNA repair. A scientifically validated bioenergetic device restores intercellular communications and normal cellular function by strengthening the biofield against the effects of EMR.

The third means of intervention is to help reverse damage caused by exposure.This includes nutritional support such as anti-oxidant supplementation, particularly helpful in countering the effects of free radicals. Supplementing with anti-oxidants SOD, catalase, glutathione, and Coq10 are especially recommended. Microwave radiation has been shown to decrease levels of these anti-oxidants that the body normally produces to protect itself. These levels are sensitive indicators in stress, aging, infections and various other disease states.

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Harmonization vs. the Precautionary Principle

Europe Sets the Agenda

Switzerland Adopts Strict Limits for Cell Towers and Power Lines

10 mG Standard for New Sources of EMFs

The Swiss government has adopted stringent new standards for public exposures from power lines and from towers used for mobile communications and radio and TV broadcasting. The new rules, which took effect on February 1, are similar to those in Russia and in China and are among the toughest in the world.

Both new and existing mobile phone towers must meet a 4 $\mu W/cm^2$ standard at 900 MHz. Other sources of electromagnetic fields and radiation (EMF–EMR) are allowed considerable administrative discretion to meet their respective limits as long as specified steps are taken to reduce exposures.

The new limits are "oriented to the future," the Federal Agency for Environment, Forests and Landscape (known as BUWAL) explains in a commentary accompanying the new rules. "Our task is to protect the public not only from agents that are known to be harmful, but also from agents that might prove to be harmful," Dr. Stefan Joss told *Microwave News*. Joss is with BUWAL's non-ionizing radiation unit in Bern.

Joss explained that the rules are an application of the precautionary principle. The Swiss Environmental Protection Law, he said, "gives a clear, prag-

(continued on p.6)

U.K. Childhood Cancer Study: New Controversy Over Power Lines

Role of Pollutants and Electric Fields at Issue

When results from the U.K. Childhood Cancer Study (UKCCS) were released, the headline on the press release read, MAJOR STUDY FINDS NO LINK BETWEEN OVERHEAD POWER CABLES AND CHILDHOOD CANCER. But that soon became a point of controversy.

Scientists at the University of Bristol argue that the UKCCS shows exactly the opposite: While the study found no link between childhood leukemia and time-averaged 50 Hz magnetic fields below 4 mG, they contend that it did find evidence of a greater leukemia risk among children living near high-voltage power lines.

One table in the UKCCS paper on EMFs and childhood leukemia lists 31 cases and 17 controls who lived near power lines for which historical line-load data were available. Children with leukemia were almost twice as likely as controls to live near one of these lines — a statistically significant difference. The study was published in the December 4 issue of *The Lancet*.

(continued on p.10)

Swiss Adopt Strict EMF and RF/MW Rules *(continued from p.1)*

matic framework for precautionary measures: Keep exposures as low as is technically feasible and economically sustainable." The need for caution is prompted by "credible indications" that chronic, low-level exposures may be harmful.

The strict EMF and EMR limits apply in all "areas with sensitive uses"—that is, where people are likely to be for extended periods of time, including homes, schools, playgrounds and hospitals. In these locations, the ordinance requires, radiation from each individual source must be kept below a specified level.

In all publicly accessible areas not deemed to be "sensitive," exposure limits are based on the guidelines of the International Commission on Non-Ionizing Radiation Protection (ICNIRP). But the ordinance restricts new construction of buildings in such areas if exposure levels exceed the lower, precautionary limits.

Magnetic fields from new power lines, substations or electric railway lines must not exceed 10 mG in places where people spend time. This is a level that is 100 times lower than that specified in most health standards, including ICNIRP's.

There are no national power line standards in the U.S. But five years ago a committee on EMF health risks set up by the National Council on Radiation Protection and Measurements (NCRP) also recommended a 10 mG exposure guideline in a draft report (see p.2 and *MWN,* J/A95). The committee, chaired by Dr. Ross Adey, then of the Veterans Administration Hospital in Loma Linda, CA, and now at the University of California, Riverside, called for limits ranging from 2 mG to 10 mG for schools, hospitals, homes and offices.

"We felt it was a prudent approach to EMF health risks, especially given that the limits would have been subjected to rigorous periodic review," Adey told *Microwave News*. Adey's report was deemed very controversial and is still under review.

For 900 MHz mobile telephone base stations, the Swiss ordinance limits exposures from each site to 4.0 V/m, or 4.2 μW/cm^2. This level is also 100 times stricter than the 450 μW/cm^2 allowed by ICNIRP and 150 times less than allowed under the exposure guidelines adopted by ANSI/IEEE. Russia's public exposure limit is 3.0 V/m, or 2.4 μW/cm^2, while China's is 5.0 V/m, or 6.6 μW/cm^2.*

The maximum exposures are 3.0 V/m for radio and television transmitters, except for long- and middle-wave transmitters, for which the standard is 8.5 V/m, or 20 μW/cm^2.

Switzerland's wireless industry had a mixed reaction to the new rules. In a December 23 statement, the trade group Protelecom called it "an expensive Christmas gift."

The Zurich-based carrier diAx looked on the positive side, stating that the ordinance "will at long last create legal certainty," adding that it "hopes that applications for building permits for mobile phone transmitters will be processed more rapidly." diAx and another carrier, Swisscom, both warned that the ordinance will make it necessary to build additional transmitters.

BUWAL's Joss said that once the ordinance takes effect, tower opponents "will have little recourse, provided a base station complies with the law. Slight delays may be possible, but that's about all." He noted, however, that comments on a draft of the ordinance indicated that, "The public wants even lower limits" (see *MWN,* M/A99).

Protelecom estimated that it will cost the industry SFr1 billion (approximately US$620 million) to comply with the new rules.

*These limits are for ambient levels, rather than for exposures from individual sources, as in the Swiss ordinance.

The New Swiss Rules: A Vote Against Harmonization

Switzerland's tough new limits are a major setback for the move toward uniform worldwide exposure standards.

There was an intensive lobbying campaign to try to persuade Swiss officials not to adopt the new limits, according to a number of close observers of recent European developments — all of whom asked not to be named. "The fear is that other countries will follow Switzerland's lead," said one source.

At a standards harmonization meeting in Erice, Sicily, a few weeks before the Swiss rules were announced, most attendees were opposed to the adoption of numerical limits stricter than those of ICNIRP, according to Dr. Mirjana Moser of the Swiss Federal Public Health Agency. Many of the participants at the November 27 meeting favored adapting to the precautionary principle, but not to the point of deviating from ICNIRP's numbers.

The Erice meeting was convened by Dr. Michael Repacholi of the World Health Organization (WHO), who heads the WHO's International EMF Project. Repacholi, formerly ICNIRP's chair, has set the globalization of health standards as one of the main goals of the EMF project. He has been sharply critical of the Swiss decision.

"If countries feel that they need further protective measures while the science is gathering information on possible health effects, this should be in the form of *policy*," Repacholi told *Microwave News* in January. As examples of policy changes, he cited public consultation on siting major EMF sources and requests for lower emissions from plants and equipment.

"Unfortunately, it seems as if the Swiss are undermining health-based standards with arbitrary reductions in EMF levels," Repacholi stated.

But Dr. Stefan Joss of BUWAL defended the Swiss rule. "Each country must decide what is technically and economically feasible. That is what we have done," he said in an interview.

Switzerland has now broken ranks with the rest of Europe, North America and Australia. Only Italy has such stringent limits for phone and broadcast towers (see box, p.7).

"It's a step backwards for harmonization," said Dr. Sheila Johnston, a consultant based in London, who attended the Erice meeting.

In most countries—with the exceptions of China and Russia (see *MWN,* S/O99 and N/D99) — the trend so far has been to favor the guidelines set by ICNIRP. For instance, last year, New Zealand moved to discourage local authorities from setting any limits stricter than ICNIRP's (see *MWN,* S/O99).

Joss questioned such predictions. He noted that, by administrative practice, strict limits for wireless base stations have already been in effect for more than a year. "During that time," said Joss, "about 2,000 new sites have been built in Switzerland, and not one site application has been denied because of radiation emissions."

Electric utilities, too, have expressed concern with the new rules, although less vocally than the wireless industry. The ordinance creates "substantial costs not only for utilities, but also for manufacturers, employers and consumers," a spokesperson for the Zurich Electricity Company, known as EKZ, told *Microwave News*.

The new limits are based on a literature review by an expert group that included university scientists as well as officials from BUWAL and the Federal Public Health Agency. "It isn't so much a matter of this or that piece of evidence tipping the balance," said Dr. Mirjana Moser of the health agency's Radiation Protection Office in Bern. "Rather, it is the degree of 'unknowledge.' At this point, we don't know enough to say with confidence that weak non-ionizing radiation is safe," she said in an interview with *Microwave News*.

BUWAL, on the other hand, identified enough evidence to support the strict limits. "Although more scientific evidence is still needed," its commentary states, "the confirmed effects already warrant the consideration of precautionary measures." Among the effects cited are epidemiological studies showing increased cancer risks, as well as studies showing disruption of the immune, melatonin and calcium systems. The commentary also points to the U.S. National Institute of Environmental Health Sciences' Working Group report that classified EMFs as a "possible carcinogen" (see *MWN,* J/A98).

On nonthermal RF/MW effects, the commentary cites the Australian study showing a cancer-promoting effect of GSM mobile phone radiation (see *MWN,* M/J97) and a Swiss study which found that people living near the Schwarzenburg shortwave transmitter had more sleep disturbances (see *MWN,* S/O96).

The ordinance does not apply to occupational exposures or to mobile phones, household appliances or medical devices. In addition, the precautionary limits do not apply to private outdoor spaces, such as the backyards of homes.

The ordinance's reliance on specific numerical limits differs from the approach proposed in a draft that BUWAL released for public comment last spring (see *MWN,* M/A99). In the draft, exposures were to be reduced by requiring that EMF and RF/MW sources be kept at specified minimum distances from locations where people spend time.

According to Joss, BUWAL decided to switch to numerical limits in response to comments on the draft from regional and local officials, environmental groups and the public, as well as from affected industries. Many of those commenting faulted the minimum distances as difficult to interpret, hard to enforce and unclear about the levels to which the public would actually be exposed.

The use of numerical limits is "the best way for Switzerland to fulfill the precautionary principle," the health agency's Moser said, explaining that, "The limits are what is technically and economically feasible, and they are relatively simple to implement."

The 10 mG limit for power frequency sources is "slightly stricter" than the minimum-distance rules in the draft, according to Joss. The same is true for wireless antennas: Under the minimum-distance system, the effective limit for 900 MHz base stations would have been 4.5 $\mu W/cm^2$, compared to 4.2 $\mu W/cm^2$ as per the final ordinance.

Officials can allow some new sources, and many existing ones, to exceed the limits. New power lines, for example, may do so if phase configuration is optimized and if other "technically feasible and economically sustainable" measures, which may include relocation, shielding and underground placement, are taken.

The full text of the *Ordinance on Non-Ionizing Radiation Protection* is available in German and in French at BUWAL's Web site: <www.admin.ch/buwal>. An accompanying commentary and a summary of public comments on the draft ordinance can also be found there. An English translation of the ordinance is being prepared and is scheduled to be posted on the Internet in late March, according to Joss.

Italian Wireless Radiation Limits Enter Second Year

Italy led the way. A year before Switzerland tightened its RF/MW exposure rules, the Italian Ministry of the Environment set a 6 V/m standard (10 $\mu W/cm^2$) for broadcast and mobile phone towers.

The standard, which took effect on January 2, 1999, applies to exposures in homes, schools and hospitals, as well as at other locations where people spend four or more hours. It is designed to protect against possible long-term effects.

The 6 V/m limit covers *all* fixed antennas — old and new — used for wireless communications, as well as radio and TV broadcasters. Emissions from mobile phones are not covered under this rule.

For other RF/MW exposures, the limits are 100 $\mu W/cm^2$ for 3 MHz-3 GHz and 400 $\mu W/cm^2$ for 3-300 GHz, both of which are stricter than the ICNIRP and ANSI/IEEE standards.

The Italian rules, like those in Switzerland, were prompted by public concerns, but they may not be having the desired effect. "The regulations have increased, rather than reduced, public anxiety," said Dr. Paolo Vecchia, the head of the non-ionizing radiation section at the Physics Laboratory of the National Institute of Health in Rome.

"Opposition to base stations for mobile phones seems to be higher than before," Vecchia told *Microwave News*. "Whether this is a temporary effect is difficult to predict." He explained that the 6 V/m limit is interpreted by some members of the public as a threshold for a severe hazard rather than as a safe exposure level.

The full text of Decree No.381, dated September 10, 1998, is available on the Internet at <www.linet.it/sre/foglio2.htm>. A very rough English translation is available by searching for "Decreto 10 settembre 1998 n.381" on AltaVista, <www.altavista.com>, and clicking on "Translate." The decree was originally published in *Gazzetta Ufficiale Della Repubblica Italiana* on November 3, 1998.

Monday, 16 September, 2002, 11:44 GMT 12:44 UK

How mobile phone masts 'vanish'

Hidden mast, as revealed by The Undetectables website

By Mark Ward
BBC News Online technology correspondent

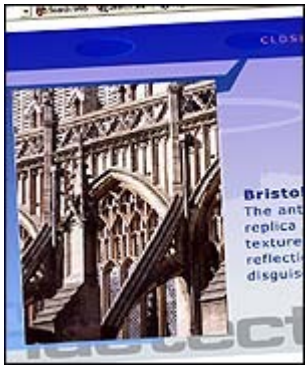
Think you could spot a mobile phone mast near your home or office? Think again.

Some mobile phone operators are going to extraordinary lengths to conceal the masts that form their networks.

They are being disguised as chimneys, clocks, windows, drainpipes, even as weathervanes, all in an effort to meet the demands of planning departments.

Controversy often surrounds applications to site phone networks. Mobile operators were recently barred from putting the masts close to schools in the UK; many parents had said they were worried about health and safety implications.

But the number of masts around the country is set to increase, as networks upgrade to second and third generation mobile technologies.



Mast hidden in Bristol church window

Each British mobile network has about 8,000 cells, which means about as many masts, and the maximum size of a cell is 35km.

In third generation (3G) mobile networks the cell can be a maximum of 8km wide, which means they need lots more masts.

Mobile abuse

This, and the fact that masts are shrinking, creates problems.

"As we come down in size there is a requirement to be closer to your customer area," said Graeme Hill, a director of James Barr Consultants which advises firms seeking mast sites. "And that means in and around residential areas."

Masts used to be about 30 metres high but as technology improves they shrink. Now some are as small as 8 metres high, said Mr Hill.

Mobile phone mast: Not a pretty sight

Before now some firms have used fake trees as masts which resembled Scots pines.

It is a tactic that might work on a hilltop when it is concealed among other trees but a fake tree on a street corner would be like putting lipstick on a gorilla.

The difficulties are compounded by the fact that many neighbourhoods welcome phone masts with all the warmth they usually reserve for traffic wardens.

And it's not just the public who are critical of phone masts.

"We deal with visual atrocities," said Sue Lipscombe, spokeswoman for The Undetectables, a firm often employed by mobile operators to help them hide masts.

Ms Lipscombe said it let operators worry about the health and safety aspects of phone masts and The Undetectables worries about the visual pollution they cause.

"Some telecoms companies can be inconsiderate," she said. "They would rather use masts and are reluctant to come to us."

The Undetectables grew out of a firm that used to build sets and scenery for Aardman Animations and it takes the same care with the fake chimney pots, drainpipes and flagpoles they create to hide masts.

A Leicester chimney, disguising phone mast

"We put in the bird muck, the pollution, everything," she said.

The result is that phone masts become utterly invisible.

Losing sight

For instance, the support pole for the golden angel weathervane on Guildford Cathedral is actually a mobile mast and supports several antennas.

In return for using the site, which sits on a hilltop and is a coveted location, the angel was regilded.

More complicated was St Stephen's church in Edinburgh. This houses eight mobile antennas sitting behind fibreglass panels in its belfry. The panels forming corner pillars were painted to resemble the surrounding brickwork.

The street sign for Northumberland Avenue in Westminster is also a plastic sign hiding a few antenna.

Dotted around Britain are fake chimney pots, fake flagpoles, fake drainpipes and fake signs all made of glass-reinforced plastic and concealing mobile antennas.

Possibly the most complicated concealment job was done on the Town Hall clock in Hungerford in Berkshire.

Antennas are mounted at the centre of each of the four faces of the clock next to the hands.

The four faces have been renewed and the clock hands themselves have been replaced with glass-reinforced plastic versions that have been balanced to ensure the clock keeps the right time.

They take such pains for good reasons, said Mr Hill.

"Concealment is not about trying to disguise the installations to fool the people living in the vicinity of them," he said.

"It's come from through planning officers and local authorities not wanting architecturally important buildings to be damaged from a visual point of view," he added.

If they did not take such trouble the landscape would be dotted with "architectural acne" said Ms Lipscombe.

And that is a growing pain that no-one wants to see and everyone is glad to see the back of as they mature.

http://news.bbc.co.uk/2/hi/in_depth/sci_tech/2000/dot_life/2261039.stm

WIRELESS COMMUNICATION FACILITIES

Background

(Photo courtesy Dan Danbeck)

Congress passed the Telecommunications Act of 1996, deregulating the telecommunications industry in an effort to promote free markets and open competition. Today, there are about seven wireless communications companies (carriers) doing business in Wisconsin, but recent trends point toward consolidation in the industry.

Major carriers include U.S. Cellular, Verizon Wireless, Sprint PCS, and Nextel. However, these firms do not actually construct towers. That is left to third-party firms such as SBA and American Tower. An additional tier of "players" often includes subcontractors with real estate expertise who locate and rent the properties where the towers are sited.

In some cases, individual carriers pay for short, single-antenna towers (about 70') to fill gaps in their coverage. More often, at least in the past, carriers have built tall towers (130' – 200') and leased space on their towers to other carriers. Leasing is a significant source of income to carriers as they attempt to pay off the high costs of tower construction and maintenance. However, with consolidation beginning among carriers, fewer companies are available to request space. Consequently, tall towers are becoming poor investments, since their antenna space is increasingly difficult to fill.

Regulation

Section 704(a)(7)(B)(i) of the Telecommunications Act of 1996 reads:

> **The regulation of the placement, construction, and modification of personal wireless service facilities by any State or local government or instrumentality thereof –**
> (I) shall not unreasonably discriminate among providers of functionally equivalent services; and
> (II) shall not prohibit or have the effect of prohibiting the provision of personal wireless services.

The Act, like many such massive bills, *speaks only in broad terms*, leaving tremendous discretion to the Federal Communications Commission (FCC) and to state Public Utility Commissions charged with implementing its provisions. Exactly what depth of coverage constitutes adequate "provision of personal wireless services" is likely to be decided in the courts on a case by case basis.

It is clear, however, that local governments *cannot* unilaterally prohibit cell towers by ordinance, zoning, or any other means. Companies who find willing landowners may sue if necessary to protect their right to build. Local governments can, however, enact ordinances to prohibit towers from certain specially identified areas, regulate tower height, specify minimum setbacks, require collocation strategies, and encourage landscaping and camouflaging techniques.

Most importantly, an ordinance gives a community 1) decision-making consistency, thereby lessening the chances for discrimination against a particular company, and 2) a verifiable basis for conditional use provisions or denials – which is critical since the Telecommunications Act requires all denials to be in writing and supported by substantial evidence.

Aesthetics

To satisfy concerns about tower appearance, wireless companies have disguised their towers as flagpoles, silos, artificial rocks, pine trees, palm trees and windmills. However, these design innovations cost the companies up to three times the typical tower construction cost, and they are most effective with shorter towers, which typically carry only one antenna.

Companies have also located antennas on stadium light poles, church steeples, and school and municipal buildings. The schools and local governments can earn $12,000 - $15,000 per antenna in lease payments annually.

Tower Sharing

Ideally, companies would coordinate their networks to ensure maximum coverage with the minimum number of towers. Called *collocation*, several antennas are located on a single tower. However, there are several obstacles:

- The companies are competitors, so they are not eager to help each other.
- A tower is limited in the number of antennas it can carry. And each antenna can only handle a certain number of calls.
- Digital (PCS) and analog (cellular) use different frequencies, which means some companies may need towers every two miles, while others need them every five miles.
- Companies grow at various rates, go out of business, merge, etc. – all of which make it extremely difficult to coordinate network configurations with certainty.
- Land use and population growth is generally not easily predictable, which makes it difficult for carriers to anticipate where new towers will need to be placed in the future to ensure coverage.

Health Effects

Public concerns have arisen over the health effects of a tower's radio frequency (RF) emissions, but *only the federal government has jurisdiction in this area.* (So far no conclusive evidence has tied health hazards to cell towers, but experts say more studies should be conducted before drawing final conclusions.) In short, a town or municipality cannot deny a request based on RF emission concerns.

Local Government Strategies

- Enact a 60-180 day moratorium on the construction of new towers to allow time to conduct a study and develop an ordinance to control tower siting and appearance. A few area communities already have ordinances that can be used as models.
- Consider offering reduced permit fees and faster processing times to companies that agree to disguise their towers or are able to collocate with others.

There are some planners who advocate a pre-siting map or template for a community that attempts to promote collocation by pinpointing tower locations, sizes, and antenna capacities. Others go even further and propose that such planning be done on a regional level, across municipal lines. Certainly, the concept of planning and working together has merit. However, like most technologies, telecommunications is a field of fast-paced change, both in the technology itself and among the industry players. This makes long-range planning extremely difficult.

One industry consultant offered this opinion: ". . . the development of a grand master plan for placement of future towers at any point in time would seem to be a function of future demand and any attempt to determine placement of new towers based on today's technology and population densities would appear to be a wasted effort . . ."

Future Directions

Satellites. Some people hope satellite communication technologies will eventually replace land-based towers. Though changes are certainly possible, this is probably unlikely, since Motorola-backed Iridium filed for bankruptcy in 1999 after its failure to sign up enough subscribers to its global satellite phone service led to a $1.5 billion debt default. "While we cannot foretell the future, it would seem that the [major providers] have satisfactorily proven the non-existence of a mass market for satellite personal telephony," said Ahmad Ghais, President of the Mobile Satellite Users Association.

Tower heights. According to Mark Reider, Head RF engineer for Alamosa Wisconsin, a tower construction firm, ". . . in the cites that are built out there today like Green Bay, Appleton, Oshkosh, Fond du Lac, we really want to bring the height of our towers down. We don't want tall towers in these cities anymore. We want as low heights, not low, but lower heights because our problems coming up are not the coverage of these cities. Our problems that will be coming up are issues that will be happening with supporting the customer base within those core units and core cities. We want to add capacity, we don't want one tower higher than another one and it is over shooting. . . . We are building towers like at 80 feet rather than the 170 feet that would have been built say two to three years ago."

An antenna has a finite data carrying capacity. Consequently, in built-up areas the problem is not so much broad coverage of the extent of the area, but rather sufficient depth of coverage. This has become of greater importance as a higher percentage of people buy cell phones. It will also grow in importance as customer expectations increase.

"In my opinion, when third generation (3-G) services are fully deployed, more people who have and use Palm Pilots or similar Internet technology or have wireless Internet laptop capabilities at their office, but due to tower zoning (locating) ordinances prohibiting towers in residential areas, will not have the same services at home. At some point in time I see some version of a shorter tower on possibly every 3rd or 4th block in a residential neighborhoods to provide broadband wireless service. That may be 3 to 5 years in the future, but the younger generation growing up with this technology will one day control the economy and the government and they will demand the same service in their residential homes that is available in their business offices," said John Santroch, a telecommunications consultant.

Economic woes. Even though growth in wireless minutes-of-use and new wireless applications is expected to mean the deployment of additional cell sites, losses sustained in capital markets are forcing wireless carriers to reduce deployment plans. As a result, American Tower, for example, reduced its new tower build guidance from 400-500 towers to 300-400 for the remainder of 2002.

This would appear to contradict the assertion in the previous section that a greater number of towers will be built in the future. However, this prediction makes some sense when taking into account the notion that towers will be lower (and therefore less costly) and industry consolidation will likely restore some financial muscle to the remaining wireless companies.

Sources: Federal Communications Commission; Wisconsin American Planning Association June 12, 2001 "Wireless Communications Tower/Antenna Siting" seminar; L.A. Times (March 17, 2001); Boston Globe (March 28, 2001); About.com interview with Ahmad Ghais, President of the Mobile Satellite Users Association; Letter to Town of Grand Chute, Wisconsin Plan Commission, August 14, 2002 by John Santroch; *RCR Wireless News* (various issues).

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The Price of Zoning Revisited: Zoning Issues Raised by the Telecommunications Act of 1996

Carol C. McDonough

The Telecommunications Act of 1996[1] contains provisions that may affect a municipality's ability to implement zoning regulations. This article briefly summarizes the history and purpose of zoning regulations, discusses the challenge to local zoning posed by the Telecommunications Act (along with recent activities at the state level and in the federal courts), and offers an approach by which municipalities can optimize their role in the process of locating sites for telecommunication towers.

Traditions of Local Control

For the better part of a century, land use control has been largely a local governmental function in our country. The first comprehensive zoning ordinance in the United States was adopted in New York City in 1916, and other municipalities soon followed. The zoning enabling acts of many states are based on the federal Standard Zoning Enabling Act of 1926. In the 1926 landmark decision *Euclid v. Ambler Realty Co.*, the US Supreme Court rejected arguments that zoning laws were an unconstitutional deprivation of property without due process, and subsequently many state courts upheld the concept of zoning. The Court's decision, involving a land owner in suburban Cleveland, is noteworthy because it reinforced the earlier notion of a hierarchy of land uses – with single-family residential use at the top of the hierarchy – to be protected. From an economic standpoint, municipal zoning regulations are meant to mitigate the *negative externalities* that a real estate owner's use of his property might impose on other members of the community.

Challenges to Local Zoning

Municipalities' longstanding and broad power to oversee land use has been called into question as legislative enactments and judicial rulings have pushed local zoners' wishes aside in favor of improved wireless phone service. One example is Congress's 1996 passage of the Telecommunications Act, which opens doors for a federal agency to overrule local officials on siting telecommunication towers. The Act (which has no impact on most zoning functions) empowers the Federal Communications Commission (FCC) to preempt local officials' decisions on the placement, construction, and modification of personal wireless service facilities. The FCC is given express regulatory power over wireless facilities' radio frequency emissions when concerns arise over possible environmental impacts.

The 1996 Act was passed following the somewhat recent development of the personal communication services (PCS) mode of wireless communication (PCS is a type of *digital* service). The development of PCS, which offers better sound quality and better security than the older cellular systems, has brought with it an increased need for tower sites on which transmitters can be placed. PCS is located at a higher frequency range, requiring towers that are closer together than the older cellular towers were. The improved technology is also likely to necessitate more towers through increased customer demand. It is estimated that, in high demand areas, PCS transmitters will have to be situated about a mile apart.

The typical municipal zoning ordinance requires a PCS provider to obtain a variance or a special permit in order to construct a cellular tower. A *variance* is required when the proposed tower would be built in a zoning district that prohibits such structures; receipt of a variance usually requires proof of hardship owing to the topography of other nearby sites. A *special permit* is required when a cell tower is a permitted use of the proposed locus; the permit indicates that the locality has found the proposed tower not to be unreasonably detrimental. Of course, under the 1996 Act the FCC can second-guess a local decision to deny approval. The FCC seems willing to require acceptance of towers that local officials reject, though the evidence to date is limited.

The federal judiciary also has shown a willingness to substitute its views for the wishes of local regulators, although it

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has not completely gutted local control. For example, in *Sprint Spectrum, L.P. v. City of Medina* (1996), a federal district court upheld Medina, WA's six-month tower moratorium as an appropriate use of the city's authority to determine a telecommunications policy, and procedures for processing applications. However, in *Illinois RSA No.3 v. County of Peoria* (1997), another federal district court overturned a county's decision denying a plaintiff's request for a cellular tower, ruling that adequate reasons for the denial were not given. Stating that the mere existence of opposition is insufficient to support denial, the court directed that the permit be issued, without even remanding to the county for further decision making.

Even the states may be inclined to overrule local officials when wireless phone service is the issue. In Massachusetts, municipalities' zoning authority has been diluted by the Massachusetts Department of Telecommunications and Energy's designation of wireless service providers as public service utilities. This designation exempts the providers from Ch. 40A, the state's basic zoning regulation, thereby limiting local authority to deny permission for tower construction.

Paying the Freight

In general, opportunities for relief from zoning restrictions – through receiving a variance or permit, or the overriding actions of a court or a legislative body – can have unexpected side effects.[2] The recipient of zoning relief obtains windfall *economic rent* (a return in excess of that called for by the accompanying risks), because he is able to put his property to a use that had previously been prohibited or controlled. At the same time, despite the fact that a use is not to be approved if it would be unreasonably detrimental to the neighborhood or municipality, negative externalities may be suffered by abutters, and by others in close proximity to the locus on which local, state, or federal relief has been granted.

In the Summer 1991 issue of this publication,[3] David Mills suggested that, because of such externalities, resource use would be enhanced if zoning rights were bought and sold, rather than given away. The development of PCS and the attendant need for towers creates a forum in which the sale of zoning rights can be revisited. In fact, the FCC employs a similar process for issuing licenses to operate PCS systems within the fifty-one major trading areas (MTAs), and the 493 basic trading areas (BTAs), within which PCS systems are marketed. Since demand by potential PCS providers typically exceeds the limited supply of licenses that the FCC issues in a particular MTA or BTA, the FCC auctions off the licensing rights.

It should be pointed out that the federal government is not hypocritical in providing relief from local restrictions; it also makes its own land available to wireless service providers. The 1996 Act specifies that a federal department or agency must make property under its control available for the placement of the new telecommunication services when doing so does not directly conflict with the department's mission. Yet even then, reasonable fees may be charged to PCS providers. (The Act also requires the FCC to provide technical support to states, to encourage them to use property under their jurisdictions for PCS purposes.)

By taking a cue from federal fee-collection efforts, and selling zoning permits for PCS transmitters, municipalities would gain revenues to offset, at least partially, the cost imposed on municipal residents by any associated negative externalities. Residents would benefit from the sale of zoning permits, in that revenues so generated would fund increased municipal services and/or allow for reduced taxes. Such a plan contains the acknowledgment that perceived aesthetic or health problems can be associated with towers and transmitters, and that residents should be compensated for those negative effects. The price of a permit should be based on the magnitude of the negative externalities, not on the PCS provider's expected profit. The greater the perceived visual or health derogation, the higher the amount that should be charged for a permit. (It is assumed that the PCS provider owns, or has leased, the land on which the tower is to be built.)

Measuring the Damages

How can the magnitude of the negative externalities – aesthetic and health issues – associated with towers be estimated? The aesthetics debate is not easily

resolved: beauty *is* in the beholder's eye, and some might argue that towers in fact *enhance*, rather than detract from, the municipal panorama's appearance. The health debate might be almost as difficult; with cell towers still in their infancy, it is far too soon to develop reliable scientific information on health effects.

Moreover, issues of aesthetics and health intertwine when tower opponents argue that towers reduce property values. Indeed, opponents might disguise concerns about aesthetics as health concerns, because the latter appear less frivolous. Yet whether the dangers are imagined or real, opponents' concerns have delayed tower approval by many local planning boards, and several lawsuits have been brought by residents against municipalities that have approved the construction of towers. Concern over cell towers has led to the formation of organizations such as the Cellular Tower Coalition (CTC), which advocates increased local control over tower siting, monitors relevant legislation, and maintains a Web site for the dissemination of information.

It is certainly possible to infer that transmission towers impose negative externalities on property values, if not necessarily on human health. Available evidence relates to the siting of electric power lines, which admittedly involve higher voltage electrical transmission than do cell towers. Colwell's 1990 article in the *Journal of Real Estate Research*[4] reports that proximity to towers supporting transmission lines reduces property values, a finding that is corroborated by the 1993 work of Gregory and von Winterfeldt.[5]

Moreover, a 1993 ruling by the New York State Court of Appeals[6] (along with a similar ruling in *Komis v. City of Sante Fe*)[7] supports the idea of a stigmatization associated with power lines. Ruling for the plaintiff, the New York court did not require *proof* that the power line posed a health risk, but only that the *perception* of danger led to a drop in property value. The court held that whether the danger is scientifically genuine is irrelevant to the central issue of market value impact.

The Rental Alternative

Because the PCS operator seeking access to a site can possibly obtain it by pursuing federal, state, or judicial remedies, a seemingly sensible approach for a municipality is simply to make the desired rights available at an appropriate price. As noted earlier, the municipal sale of zoning rights for cellular tower construction would enable a community, and thus its residents, to be compensated for the negative externalities that may derive from cell towers' existence. Yet while selling zoning rights is the most efficient economic solution, the outright sale of regulatory approval raises legal questions.

The municipal sale of zoning rights for tower construction would enable a community, and thus its residents, to be compensated for the negative externalities that may derive from cell towers' existence.

Still, a city or town might achieve a similar economic outcome, while avoiding legal confrontations, by *leasing* space owned by the municipality to PCS operators for the construction of towers. The centralized locations of publicly owned buildings could prove ideal for the siting of wireless transmitters. Municipally-owned access strips adjacent to streets and highways would be other possible sites for the placement of cell towers.

Several localities have already considered "renting" out municipal space for cellular towers. Prince Georges County, MD plans to charge rent to telecommunications firms for putting towers on public land. In Illinois, the Warrenville village council approved a permit to allow a cellular transmitter on the local water tower, in exchange for benefits to the village, although nearby Naperville rejected plans to install cellular antennae on a local post office and the Municipal Center, and North Barrington home owners actually sued local planning officials for approving a cellular tower at the Village Hall.

Taking the Initiative

Residents concerned about PCS towers for reasons of aesthetics, health, or property values may oppose tower siting on public land under any circumstances, viewing the receipt of money as inappropriate collaboration with PCS providers. However, because the Telecommunications Act of 1996 precludes the blanket denial of permission to build cell towers, and because courts and state legislatures have also supported the industry, it would seem to be in residents' best interests to participate actively in the process. In fact, by offering to lease municipal land for tower siting, a locality would be able to gain some control over the process, along with some revenue. The rent would compensate citizens, at least in part, for any negative externalities created by the wireless systems. Moreover, if operators had to price their services to reflect the negative externality costs currently borne by others, the allocation of societal resources to this burgeoning industry would be reduced to a more efficient level. ■

Dr. McDonough is a Professor of Economics at the University of Massachusetts-Lowell. She also serves as Clerk of the Andover, MA Zoning Board of Appeals.

Notes

1. The Telecommunications Act of 1996, Sec. 704. Facilities Siting; Radio Frequency Emission Stds.
2. Colwell, Peter F., "Tender Mercies: Efficient and Equitable Land Use Change," *Real Estate Economics* 25(4), Winter 1997, pp. 525-537.
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5. Gregory, Robin and Detlof von Winterfeldt, "The Effects of Electromagnetic Fields from Transmission Lines on Public Fears & Property Values," *J. of Environmental Mgt.* 48, 1996, pp. 201-214.
6. *Ibid.*
7. *Ibid.*

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How safe is cell tower at school?

By Rodney Thrash, Times Staff Writer

Published Monday, February 23, 2009

TAMPA — Every decade or so, some product sparks debate, stirs health concerns and raises scientific quandaries.

In the 1960s, it was cigarettes. In the 1970s, it was lead-based paint. In the 1990s, it was irradiated food.

Now cell phone towers are stoking controversies in school districts across the country.

Towers, or base stations as they are also called, are not new; the Federal Communications Commission, which licenses cell phone companies, has authorized construction of towers since the late 1980s. But in recent years, the towers have moved from mountaintops and downtown rooftops to back yards and schoolyards, where customer demand is greatest and outrage is loudest.

And even though most public health agencies agree that radiofrequency levels produced by towers are significantly lower than those produced by cell phones, long-term exposure to towers has produced greater concern.

Look no further than Hillsborough County schools.

Parents unsuccessfully asked the County Commission for a moratorium on towers last week.

The issue has driven a wedge between administrators who are looking for alternative sources of cash as the district's budget shrinks and parents who don't want towers anywhere near schools until more scientific research is done.

It also has divided the scientific community, domestically and abroad.

• • •

Google "cell phone tower," and you'll find studies that lend credence to opponents' fears and ones that bolster Hillsborough's claims that they're safe.

"It's a daunting task to cull through what's there," said Bill Cook, the South Tampa dad who has become the public face for the parents group People Against Cell Towers at Schools. "Every day, we uncover more information."

The agencies that determine if something causes cancer — the International Agency for Research on Cancer, the National Toxicology Program and the Environmental Protection Agency — have not issued findings on cellular phone towers.

But the American Cancer Society reported that towers are unlikely to cause cancer or any other health problems, a position shared by at least seven other public health agencies.

The Food and Drug Administration took measurements near cellular towers and found that ground-level exposures are typically thousands of times less than FCC limits.

And the World Health Organization said in 2007 that the human body absorbs five times as much radiofrequency energy from televisions and FM radios than cell towers.

"Our best scientific understanding indicates that there are no health consequences of base station RF exposure," the study noted.

It also showed that "most public health agencies continue to favor additional research."

• • •

Hillsborough parents rattle off studies and experts of their own:

• Dr. Ronald Herberman, the director of the University of Pittsburgh Cancer Institute, issued an advisory to 3,000 colleagues about the possible health risks associated with cellular phone use in July.

• Dr. David Carpenter, the director of the Institute of Health and Environment at the University of Albany, testified before Congress in September that cell phones can cause cancer and affect children more than adults.

He based his findings, in part, on a Swedish study that found the chances of developing brain cancer go up if children use cell phones before the age of 20.

• Dr. George Carlo, a former chief scientist of the Wireless Technology Research program, dismissed a Denmark study that showed no link between cell phone use and cancer.

"The jury is out," Cook said. "We don't know that it's safe."

• • •

Demands for proof that exposure to cell phone towers is safe may never be satisfied, public health officials say.

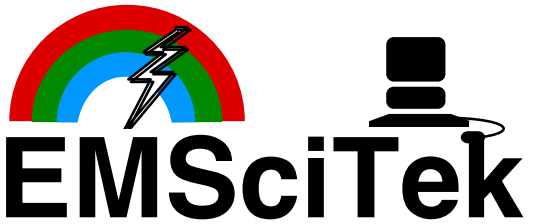
"Scientific inquiry can test for harmful effects," the 2007 WHO report concluded, "but it can never prove that something is safe."

As the debate between scientists and the wireless industry rages on, Cook and other parents plan to work with the county to amend the land-use code so that schools at least hold public meetings before towers rise. The process could take months.

"This isn't going to happen overnight," Cook said. "We're not going to get the master stroke. It may take any number of things to change."

Times researcher John Martin contributed to this report. Rodney Thrash can be reached at rthrash@sptimes.com or (813) 269-5303.

http://www.tampabay.com/news/education/k12/article978572.ece



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September 29, 2000

Dr. Frank L. Till, Jr., Superintendent
Broward County School District
KCW
600 SE Third Avenue
Fort Lauderdale FL 33301

Broward County School Board
Ms. Darla Carter
Ms. Diana Wasserman-Rubin
Ms. Carole Andrews
Ms. Judie Budnick
Mr. Paul Eichner
Ms. Stephanie Arma Kraft
Ms. Miriam Oliphant
Dr. Robert Parks
Ms. Lois Wexler
Broward School District Safety/Risk Management Director

Dear School Board members:

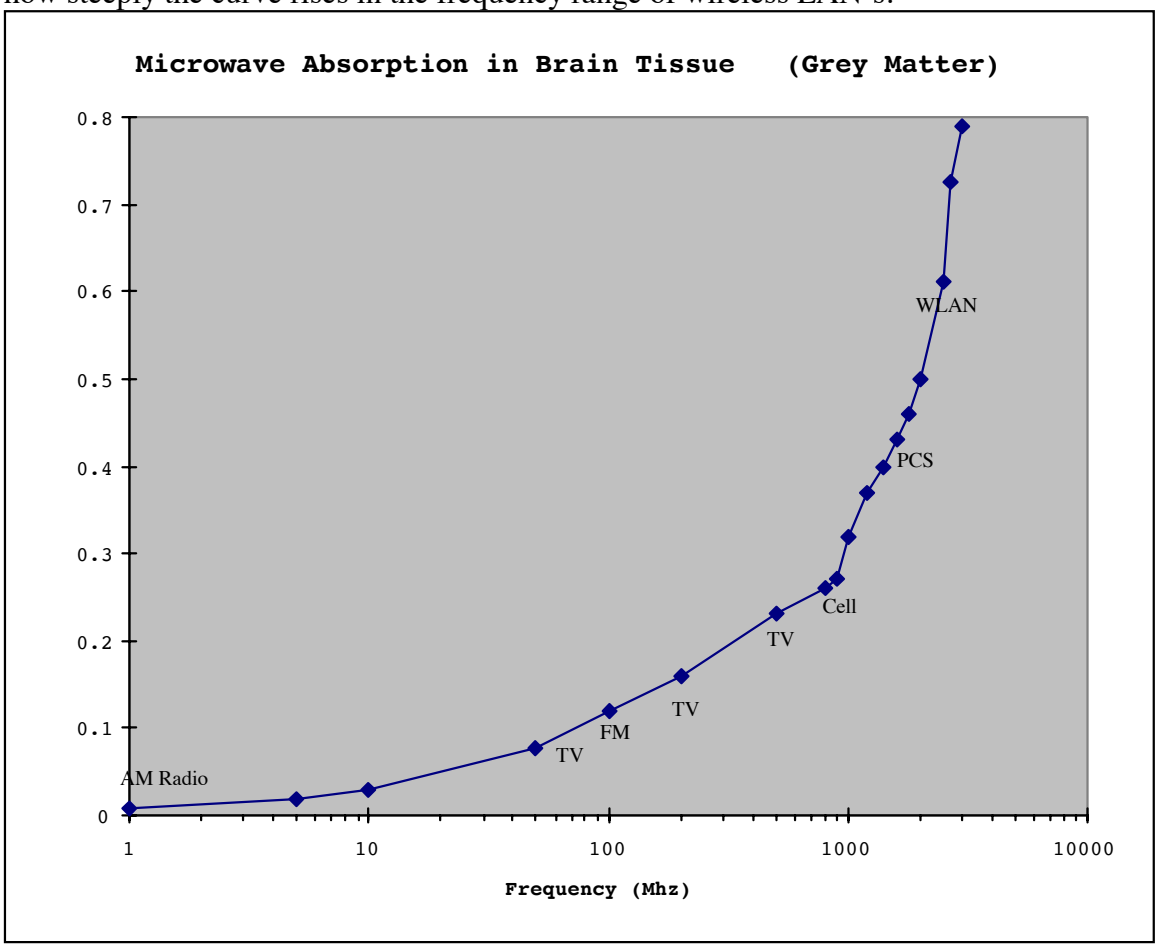
I am a retired physicist who has been concerned about the potential health implications of the "wireless revolution" for several years. Prior to 1994, I was a staff scientist at Argonne National Laboratory near Chicago. Prior to that time, I was a staff member of several federal and private research institutions in Tennessee and California. I am a member of both the American Physical Society and the Institute of Electrical and Electronics Engineers (IEEE). In addition, my biography is listed in both American Men and Women of Science and Who's Who in Science and Engineering. In addition to my regular career, I have been a part time professor at a junior college in Illinois and (28 years earlier) at a state university in California. In addition, I have served as an expert witness, and I have served on a peer review panel for a federal government agency. Further, I am one of the cofounders of the EMR Network, a national nonprofit organization of volunteers who try to educate the public and federal, state, and local officials about the health hazards of the "wireless revolution" and help people who are adversely afffected by this technological movement. I am aware that you are currently considering whether to install computers equipped with wireless Local Area Networks (LAN's) in your schools. Accordingly, I would like to share with you my concerns about the use of these computer systems in classrooms attended by young children.

The present Federal Communications Commission (FCC) guidelines for RF safety and health are used by the telecommunications industry to proclaim the safety of their products, based solely on the concept that one must protect people against heating of their biological cells. Many researchers believe that harmful biological effects can and do occur at radiation levels hundreds and even thousands of times less than the present FCC safety limits. Also, the three engineering standards commissions that advise the FCC concerning safety standards for radiofrequency (RF) radiation will meet again in 2002. After they submit their recommendations, the FCC will probably issue revised guidelines for safety of wireless systems by 2006. The current FCC guidelines were based entirely on research prior to 1986. The new guidelines should benefit from a decade and a half of additional research, much of which has demonstrated significant biological effects from RF and microwave radiation at radiation intensity levels far, far lower than those at which the radiation is a thermal hazard. Thus, you have to be concerned about the possibility that wireless LAN's based on today's safety guidelines will not conform to future guidelines.

To give you some technical details, I have looked into the Apple iMac Air Port system, specifically, but other competitive systems constitute similar threats to the health of children, in my opinion. The Air Port is Apple's name for technology developed by Lucent Technologies. This system uses a PCMCIA card that plugs into the side of the computer. This card contains a wireless modem that transmits at a frequency of about 2.5 Ghz (the frequency of microwave ovens). The antenna on this card has a gain of 5 decibels, which means that its radiation is broadcast almost equally in all directions, but the radiation coming straight out from the card is in the preferred direction, and it is about 3 times stronger (more intense) than the radiation broadcast in other directions.

I have assumed that a child sits about 1.5 feet away from the computer. This system allows no more than 8 computers to interact simultaneously with a single base station (to prevent interference between the different computers sending and receiving data, so the child will only receive any significant amount of radiation from his/her individual computer. However, in a classroom using these computers, there will probably be more than one base station with its set of 8 slave computers - provided interference can be avoided - perhaps by using a different band of frequencies for each base station and slave computers combination (just a guess). Thus, it seems likely to me that a child may get more radiation than just that from his/her own computer. However, I have made a conservative estimate of the total amount of radiation density that a child will likely receive from his/her own computer, accounting for all the directions along which electromagnetic waves emerging from the Air Port's antenna can reach the child. The estimated radiation density is 6-9 microwatts per square centimeter. It seems unwise to me to subject a child on a long term, frequent use basis to this much radiation, especially at the extremely high frequency that was stated. While this radiation intensity is far less than the intensity that will cause biological cell heating, it is well within the range of intensities at which biological effects have been observed in the laboratory and in epidemiological studies of people who live near FM radio and TV broadcast installations. Further, the wireless LAN frequency is so high that the absorption of the radiation into

human tissue is more severe than would be true at lower frequencies. The graph on the next page is a plot of the absorption coefficient of brain tissue for RF radiation. Note how steeply the curve rises in the frequency range of wireless LAN's.

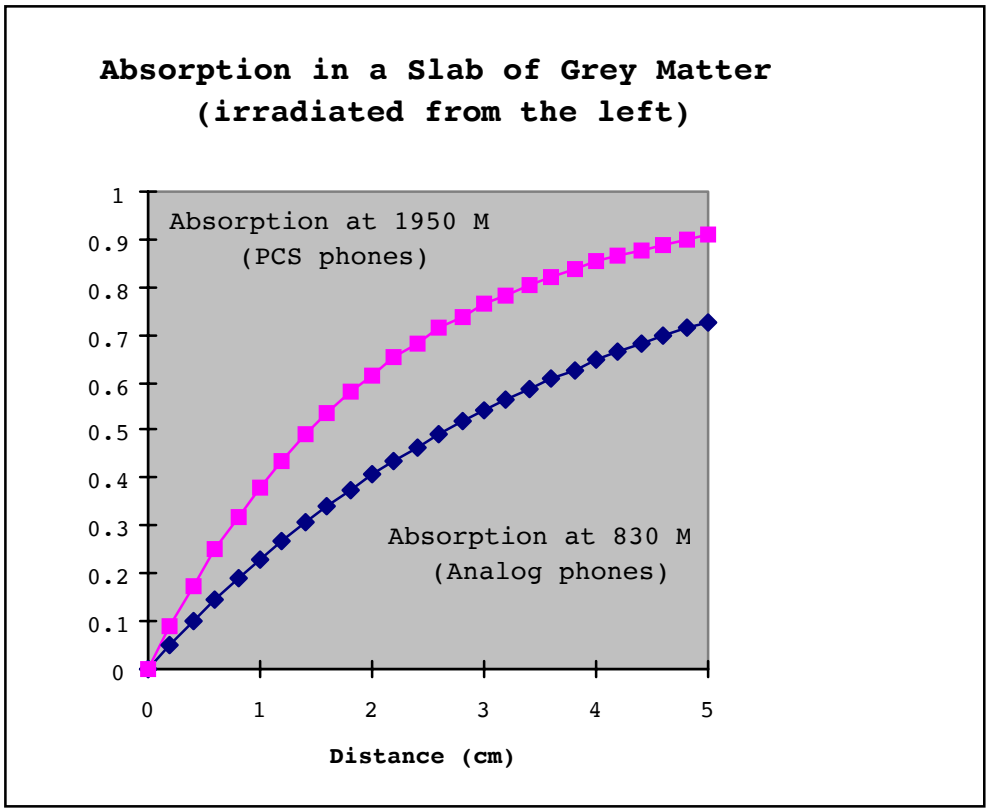


I prepared this graph, using an equation from J.A. Stratton's book *Electromagnetic Theory*, McGraw-Hill, New York (1941). The calculation required human tissue dielectric properties obtained from Air Force report AL/OE-TR-1996-0037 "Compilation of the Dielectric Properties of Body Tissues at RF and Microwave Frequencies" by Dr. Camelia Gabriel of the University of London. Gabriel's study was done for Brooks Air Force Base in Texas, and her results have also been published in three successive articles in *Physics of Medicine and Biology*, vol. 41, No. 11, pp. 2231-2293 (1996).

The significance of this plot is the following: At very low RF frequencies - like the frequencies associated with AM broadcasting - radio waves mostly pass through human tissue with very little absorption. Unless you are very close to a very powerful transmitter, there is very little danger that you will be physically affected by such radiation. As the frequency gets ever higher, a larger fraction of the incident radiation will be absorbed at a specific distance into the tissue. For example, the absorption coefficient for brain tissue is about twice as high for PCS digital phone frequencies 1600-1900 Mhz or 1.6-1.9 Ghz) as it is at analog cellular phone frequencies (800-900 Mhz).

The wireless LAN's that Lucent developed operate at frequencies of about 2.5 Ghz, and the absorption coefficient at that frequency is about 50% higher than at PCS frequency.

Another way to understand this is to look at how radiation might penetrate into a (one dimensional) slab of simulated brain tissue. The plot on the next page shows the absorption profile for the two different values of absorption coefficient for PCS phones and analog cellular phones.

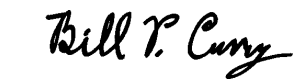


You can see that about 40 % of the incident radiation has been absorbed at the penetration distance of 2 cm for analog phones, and about 65% of the incident radiation has been absorbed at the same distance for PCS phones. I have not computed a similar curve for the frequency (2.5 Ghz) that corresponds to the Air Port Wireless LAN, but I can make an educated guess and say that about 80 % of the incident radiation will have been absorbed at 2 cm for the larger absorption coefficient appropriate for 2.5 Ghz radiation. This means that the energy deposition profile from the edge of the brain inward will be more localized at the higher absorption coefficients. Low frequencies will pass right on through the slab; high frequencies will be absorbed within progressively shorter penetration distances, as the frequency increases. I think that the steepness of the absorption profile in human tissue is a pertinent factor when considering the potential for adverse health effects at such high frequencies.

Dr. Ross Adey, University of California at Riverside faculty member and eminent biological researcher, has warned that children are more vulnerable than adults to adverse effects of microwave radiation for at least two reasons: 1) their brains are smaller than adults and still developing and 2) their hormonal systems are rapidly changing. I have additional concerns that, as frequencies go higher, there is some likelihood of absorbing radiation into natural energy storage modes of complicated organic molecules that are most significant to life. Already, Henry Lai and his coworker N.P. Singh at the University of Washington in Seattle have discovered DNA molecule breakage occurs when rat brain cells are irradiated with 2.5 Ghz radiation at absorbed radiation levels considered "safe" by the FCC. Jerry Phillips (formerly at the bioelectromagnetics laboratory associated with Loma Linda University in Southern California) has performed similar experiments at cellular phone frequencies and found similar results, but the absorbed radiation levels were almost 700 times lower than the FCC safe limit. Further, a neurological group in Sweden have noticed significant reduction of the blood - brain barrier at absorbed radiation levels as much as 4,000 times lower than what the FCC considers safe. The blood - brain barrier protects the brain from the incursion of harmful substances that may be circulating in the blood stream - infectious agents and harmful chemical substances. Reduction of the blood - brain barrier is a potential factor in both cancer formation and neurodegenerative diseases such as Alzheimer's disease and Parkinson's disease, and it has been implicated in causing headaches to frequent cell phone users who have long conversations.

While much research still needs to be done (and probably won't be, on account of lack of funding). I feel that wireless LAN's should be kept out of the classroom, and I urge you to make a similar decision. Thank you for considering my views on this subject.

Sincerely yours,



Bill P. Curry, Ph.D.
Consulting Physicist

washingtonpost.com

Schools Are No Place for Cell Towers

Thursday, November 18, 2004; Page VA05

The Fairfax County School Board's commercial venture to build cell towers at schools is an unwise policy that puts schoolchildren and staff at risk. In the long run, it may turn out to be a financial albatross, as well.

Antennas on cell towers emit radio-frequency radiation that research has shown to cause biological effects that can be linked to cancer and other diseases, often at power levels thousands of times below government exposure standards. Documented bio-effects from this technology include slowed motor skills and reaction time; deficits in memory and attention; white blood cell changes; compromise of the blood filtering system protecting the brain; impaired nervous system activity; increased heart rate and blood pressure; decreased immune system function; DNA damage in human blood cells; headaches, tinnitus and spatial disorientation; and stimulation of leukemia cell growth.

Already, the school system has placed cell towers at six schools, approved towers for eight more and quietly has begun zoning five more to receive them. Industry representatives under contract with the school system extol the financial benefits to school principals and PTAs without warning them about health risks. Under the contracts, every school is a candidate for a cell tower.

The revenue the school system receives is minuscule in comparison to the potential risks posed by this technology. In fact, if carefully analyzed, the school system may actually be losing money. Currently, the school system is grossing only a few tens of thousands of dollars under this arrangement -- less than $1 a child -- while it spends more than $10,000 a year to educate each child and has a $1.8 billion budget. There may be no profit at all after overhead costs are considered, including the cost of contract administration, emissions testing (which school officials only recently said they will do after parents applied pressure), potential liability costs and insurance costs.

Proponents of the deal claim that the radiation emissions are well under federal exposure standards. But U.S. exposure standards are the least protective in the world. Standards in other countries vary widely, reflecting the uncertainty in ascertaining the health risks based on current research. According to a July 2002 letter from the Environmental Protection Agency, U.S. exposure standards are not up to date with the latest research, and therefore cannot be characterized as fully protective of people. Many scientists have documented bio-effects at thousands of times below government exposure standards.

In August, the International Association of Firefighters voted for a moratorium on placing cell towers at fire stations until a study of health impacts can be done. This action came on the heels of a pilot study that found neurological changes in six firefighters living and working near cell towers for several years. If cell towers are too risky for firefighters -- who are paid to enter burning buildings and who are routinely exposed to toxic fumes -- then it makes no sense to put cell towers near schoolchildren.

As researchers continue battling over the extent to which radio-frequency radiation from cell towers may cause harm and how far they should be placed from people, it makes sense to take a cautious approach toward our children. These antennas have nothing to do with the schools' educational mission. It simply doesn't make sense to expose our kids to this kind of health and safety risk -- and it's time to put an end to it.

The Fairfax County school system has installed poles with cell phone antennas at six schools and one administrative building and is planning to add them at several more schools. Some parents say they are worried about the potential health risks from radio-frequency radiation. Karl Polzer of the Falls Church area is a health policy analyst, parent of children attending county schools and co-founder of Protect Schools, www.protectschools.org.

Putting Cell Phone Antennas Near Schools Is Too Risky

Washington Post Fairfax Extra section, Thursday, December 30, 2004; Page VA10

On Nov. 18 and Dec. 2, Fairfax Extra published guest columns discussing both sides of a debate about the Fairfax County School Board's commercial venture to build cell phone towers at schools. The columns prompted the following letters from two researchers on radio frequency radiation.

Letter from Magda Havas, Ph.D.:

I read the article in Fairfax Extra by Karl Polzer ["Schools Are No Place for Cell Towers," Nov. 18] and the rebuttal ["Cell Phone Antennas No Threat to Schools," Dec. 2] by John Walls, vice president of public affairs for the Cellular Telecommunications and Internet Association.

In the rebuttal, Walls stated:

"While the wireless industry appreciates the concerns of some parents in this instance, they can be assured that no one's health, particularly their children's, would be subjected to any unnecessary risks. The possibility of negative health effects on people in close proximity to cell phone towers has been exhaustively researched by the world's leading health organizations, and all of them have reached the same conclusion: Observing prescribed standards of power emission, such facilities do not pose any threat to human health."

This statement is blatantly false. His reference is to a fact sheet on the World Health Organization Web site that was last revised in 2000 and is now out of date. Even in 2000 the health effects were not "exhaustively researched," and indeed there is much disagreement about what is considered safe. That is why radio frequency guidelines worldwide range more than six orders of magnitude! Since biological effects associated with radio frequency radiation are likely to be the same in Austria, Italy, China, Hungary, Switzerland and Russia, why do these countries have much lower guidelines than the United States?

Recent studies show that people who live within 300 meters of mobile phone base stations have a number of symptoms that are now referred to as electrical hyper-sensitivity and were originally called radio wave illness. These include fatigue, sleep disturbances, headaches, difficulty concentrating, depression, memory loss, visual and hearing disruptions, irritability, skin problems and dizziness. Symptoms are particularly severe for those within 10 meters (30 feet) of a cell phone mast.

Exposure guidelines proposed by the World Health Organization are based only on short-term effects and are not designed to protect the public from long-term effects and non-thermal effects.

There is increasing evidence showing that microwave radiation is a threat to well-being and health. Schools and all other places where humans, and especially children, stay for long periods should have safe exposure levels. Before an antenna is mounted, it is possible to calculate the theoretical exposure. It should be noted that under the antennas there can be higher exposure levels because the side lobes of radiation touch ground in close proximity to the radiation source.

In order to reduce the health risks from cell towers significantly, the public health department of Salzburg in Austria recommends exposure levels not exceeding 0.001 microwatts per centimeter squared outside and 0.0001 microwatts per centimeter squared inside buildings. The basis of this recommendation is the empirical evidence that is backed by all three epidemiological cell tower studies.

Because children's bodies are developing and research is not complete on the health effects of microwave radiation, greater caution should be taken in siting cell towers near places where children spend considerable amounts of time. As a general rule, cell towers should not be placed near schools.

Gerd Oberfeld, MD

Public Health Officer for Environmental Medicine,

Province of Salzburg, Austria

Electrical hypersensitivity is a very real phenomenon and is classified as a disability in Sweden. The World Health Organization organized a workshop in October in Prague on electrical hypersensitivity.

Guidelines for radio frequency exposure in the United States and Canada are based on thermal effects. There is now considerable evidence that non-thermal effects exist below existing guidelines and that these may be "associated with adverse health effects," according to the Royal Society of Canada.

These studies tell me that we should be careful with the placement of mobile phone base stations. If in doubt, do not place these base stations near schools and homes and places where people spend considerable time. The adverse biological effects and eventual lawsuits are simply not worth the price of this shortsighted thinking.

Magda Havas, *Associate Professor, Environmental and Resource Studies Program,*

Trent University, Peterborough, Ontario

Letter from Gerd Oberfeld, M.D.:

With respect to negative health effects on people living in close proximity to cell phone towers, there are three different epidemiological studies, including our recent study.

All of them found statistically significant relationships between exposure to radiation and health effects. The findings are from 2002 and 2004. It is important to note that cell phone antennas emit microwave radiation all the time and may act as a chronic stressor at low exposure levels. Two of the studies did measurements in subjects' bedrooms and found significant increases in stress-related symptoms as well as neurological symptoms above exposures to 0.005 microwatts per centimeter squared. This is roughly 500,000 times slower than U.S. exposure standards for cell tower radiation. The main symptoms reported by our study were depression, fatigue, sleep disorders and concentration difficulty. These symptoms were related to exposure levels, not distance from the antennas.

Concerning cellular phones, recent research from a project called EU-Reflex, or European Union Risk Evaluation of Potential Environmental Hazards From Low-Frequency Electromagnetic Field Exposure Using Sensitive In Vitro Methods, shows that cells exposed to cell phone radiation exhibit chromosomal damage well below the exposure guidelines of the World Health Organization. Also, a new study by Swedish researchers confirms previous findings that long-term exposure to cellular phones increases the risk for acoustic neuroma, a benign type of brain tumor.

CONTACT: Dr. Mark Glaser, President, Fairfax County Federation of Teachers
at mlglaser@covad.net or 703.451.6840

FOR IMMEDIATE RELEASE

Fairfax Teachers Union Says "No" to Cell-Phone Towers at Schools

Fairfax County Federation of Teachers Cites Health Concerns

FAIRFAX, Va. (February 4, 2005) – Citing concerns about the health of faculty, staff and students, a local teachers union has called for a moratorium on construction of cell-phone towers at Fairfax County public schools and the removal of existing cell-phone towers from school property.

The resolution, passed by the Fairfax County Federation of Teachers (FCFT) on January 27, comes at a time when the Fairfax County School Board finds itself under fire from a growing number of parents for contracting with the wireless industry to put cell-phone towers at 14 public schools and considering erecting them at an additional five. Fairfax County parents opposed to the placing of cell-phone towers at schools have created a Web site, www.protectschools.org, to give voice to their concerns.

"We are distressed that the School Board voted on this issue without any input from the community," says FCFT president Mark Glaser, Ph.D. "That shows an incredible disregard for the health and welfare of their own employees, not to mention their students."

The FCFT resolution comes just weeks after the Fairfax County Council of PTAs asked for a moratorium on the construction of cell-phone towers at schools – and just months after the International Association of Firefighters called for a moratorium on the placing of cell-phone towers at all fire stations in the U.S. and Canada in the wake of a pilot study's findings of neurological changes in six firefighters who lived and worked near the towers.

While the research is not clear-cut, numerous studies suggest that low levels of radiofrequency radiation of the sort emitted by cell-phone towers cause biological effects that may be linked to cancer and other diseases. Those who advocate erecting the towers at schools claim that the emissions are well under FCC exposure standards, while opponents point out that those standards are among the least stringent in the world and need updating.

“There is enough research suggesting negative health effects from cell-phone towers to make us think twice about putting them up in close proximity to a workplace full of adults, much less a school full of children,” says Glaser. “No amount of money is worth putting our children and teachers at risk.”

# # #

TIMESONLINE

From The Times

April 23, 2007

Phone mast pulled down after school cancer scare

David Rose

A mobile phone mast has been dismantled after residents complained over a localised cluster of cancer cases, raising fresh concerns over the technology's impact on health.

A study of seven separate sites has reported higher incidences of cancer, brain haemorrhages and other serious illnesses within a radius of 400 yards of mobile phone masts.

They included a cluster in Warwickshire of 31 cancer cases concentrated around a single street, which could be attributed to the proximity of a nearby mast, researchers said.

A quarter of the 30 staff at a special school within sight of the 90ft high mast have developed tumours since 2000, and another quarter have suffered significant health problems.

The mast, which was installed up to 15 years ago, was pulled down by the mobile phone operator O after the presentation of the evidence by local protesters. While rejecting any links to ill-health, O admitted that the decision was "clearly rare and unusual".

Studies in other European countries suggest a rise in cancers close to masts. In 2005 Sir William Stewart, chairman of the Health Protection Agency, said he found four such studies to be of concern but that the health risk remained unproven.

John Walker, a scientist who compiled the cluster studies said he was convinced they showed a potential link between radiation emitted from the masts and illnesses discovered in local populations.

Marin Independent Journal
Marin County, California

May 6, 2001

Wireless school plans on hold

By Carolyn R. Saraspi

Parents and teachers concerned about the health affects of radio waves used in wireless Internet connectivity have put the Mill Valley School District's plans to install the technology on hold. About two dozen teachers and parents primarily from Tamalpais Valley Elementary School are afraid electromagnetic radiation from wireless access points could be harmful.

"There are concerns, whether proven scientifically or not," said Rachel Jeter, who has children in second and fifth grades at Tam Valley.

"I would rather not have my kids as guinea pigs for the new technology," she said. School Superintendent Barbara Young, who was among officials who met with parents and teachers last Tuesday, said the district's facilities committee will meet this week to review the issue.

"Unfortunately, this has been planned for quite some time. It has been communicated to schools regarding this," Young said. "(But) certainly, the community and staff concerns are of interest to us."

As part of its ongoing $14.8 million modernization project, the district planned to incorporate wireless network cards and access points into its existing computer system, as well as upgrading wiring and other hardware.

Technology Managers of Sacramento has a contract to do the hardwire upgrades, and was on board to do the wireless integration as well. But its agreement with the district is flexible, said David Harding of Pacific Program Management, the Sacramento-based construction firm overseeing the modernization.

If the district goes ahead with the plans this summer, it will be among the first K-8 districts in the state to incorporate wireless technology.

The wireless access points, such as the AirPort Base Station by Apple Computers, communicate via low-frequency radio waves with workstations containing wireless network cards, which work like wired phone modems.

Access points would be situated primarily in school ceilings and cabinets, Harding said, allowing users to bring laptop computers up to 500 feet outside the classroom and still be connected to a school server.

That means teachers like Jim Thomas of Mill Valley Middle School wouldn't have to spend hours transferring information, such as student grades and notes, from paper to electronic databases.

"If I were observing students working in groups and assessing if they are cooperating and on task,

instead of walking around with a clipboard, I can use a Powerbook," said Thomas, who has been using his own wireless products in his seventh-grade classroom.

"For multimedia projects, I could take the Powerbook where the project is stored to another teacher and say, 'What do you think?'" he said.

In addition, students could take a computer away from the din of a busy classroom to a quiet area, work on a writing assignment and print it.

Wireless also allows more students to get on the Web because more computers can be linked to the Internet through one wireless access point than could be connected through a wired switch. Each of Mill Valley's classrooms now have two connections to the Internet. If the modernization goes through as planned, they will increase to four, Harding said.

Because five computers can link to an access point, "you could hook up one AirPort and have five computers work off that, then have five more connect to that," Thomas said. "Theoretically, you could get 25 computers off one (Internet Protocol) address."

That eases up information bottlenecks, resulting in faster-loading Web pages and the ability to access larger data files.

As a result, students could conduct more sophisticated projects, such as collaborations with other students in different parts of the globe, aside from using e-mail.

"Book reports don't have to be the same old written or oral presentation. They can be three dimensional," Thomas said.

With more schools gravitating to wireless, it's crucial that the public know about the possible side effects, said Libby Kelley, head of the Council of Wireless Technology Impacts in Novato. She has been active in the campaign to stop installations of mobile telecommunications antennas in Marin, and was a plaintiff in a lawsuit challenging the Federal Communications Commission's guidelines for safe radio wave use.

"It's important that people understand the frequency, duration of exposure and physical characteristics of children make the feasibility of introducing wireless technology in the classroom an issue," said Kelley, who will speak at Tam Valley's parent group meeting at the school at 7 p.m. Wednesday.

"Scientific studies indicate chronic exposure to these low microwave radiation can affect normal functioning" and can result in learning disabilities, depression and memory loss, she said.

But technology experts and school officials say radiation from wireless access points are lower than those emitted from cellular phones and microwaves, and are too minute to cause any harm. "From what we understand, the wireless computer radiation would not have as much of an impact simply because you're not putting it right next to your head," said Dan Lancaster, director of business and information systems for the Marin County Office of Education.

"The electromagnetic radiation drops off quite rapidly with distance," Lancaster said. "The closer the antenna is to the body, the more of an impact it will have.

"According to federal regulations and research done so far, there's been no strong scientific evidence that radiation from cell phones, much less radiation from laptops, have significant health affects."

Aside from the mobile aspect, Mill Valley was attracted to wireless because of its price. The current project is estimated at $500,000 - a third of the district's original $1.5 million budget to fully upgrade its computer system and keep it wired, Harding said.

A wireless system is much cheaper than the traditional wired network because there's no costly

cabling and minimal disruption to the physical environment, said Juli McReynolds, owner of Technology Managers.

"The materials themselves, like the fiber optics, are very costly. When you consider wiring a whole school, there' s just so much cable," McReynolds said. "Then you have to dig into the ground, lay the wiring and do the concrete improvements. There's tons of expense." Because of the cost savings, more California schools are starting to look at wireless solutions for older school buildings.

"Some of our schools are even looking at a situation with hardwire to get Internet connections coming into the building. But a portable lab can be wheeled in with wireless connectivity for folks to get online," said Bonnie Marks of the California Technology Assistance Project, which helps schools weave high-tech into the classroom.

Marks is coordinator for the state project's Region IV, which includes Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo and Solano counties.

The project gave $50,000 to the Marin County Office of Education's to help pay for a cart of 20 iMac laptops, an AirPort and a printer that schools may borrow. Lancaster said the portable laptop lab helps out students whose projects require daily Web research for long periods of time.

"Typically, a history class wouldn't have access to computers every day for two months," he said. Because Mill Valley thought it would save $1 million by bringing in wireless, it has asked Technology Managers to remove the district's antiquated telephone system and install a network that connects schools with each other and to the district offices.

The phone system would also have centralized voice mail, plus the capability to transmit audio over the district's intranet to computers.

Harding said administrators will look over the district's budget during this week's facilities meeting to review the financial implications of scrapping the wireless plan. "The bottom line is that the concerns have been heard, and not to rush ahead without all the facts in hand," he said.

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Government, Schools

State Rep. Says Cell Towers Could Pose Threat to Children

Rep. Karla Drenner, District 86, is holding a hearing today to question the erection of cell phone towers on a number of school sites countywide.

By Jonathan Cribbs . Email the author . February 21, 2012

When frustrated DeKalb County residents gather in a small meeting room in downtown Atlanta this morning to listen to a hearing about cell phone towers on school grounds, they'll have a significant new ally – the state representative who organized the meeting.

Cell Phone Tower FP - 140

Upload Photos and Videos

Months after groups of parents organized to protest a DeKalb County School System plan to put cell phone towers on a number of school sites across the county, Rep. Karla Drenner, District 86, has come out in the last week against the proposal between the school system and T-Mobile, breathing new life into the controversial issue.

"The long term effects of exposure to the type of radiation produced by cell phone towers are not fully known, but initial data indicates cause for concern," Drenner said in a statement last week. "Placing cell towers on school property unnecessarily places our children in potential danger and could even be viewed as experimenting with our children's health. I am strongly committed to stopping these efforts to put cell phone towers on school property."

In an interview with North Druid Hills-Briarcliff Patch, Drenner said she is introducing two bills into the state legislature. The first bill would prevent cell phone towers from being built on school property anywhere in Georgia. Her second bill would only ban the practice in DeKalb County.

The DeKalb County Board of Education approved in July towers at several schools in the county, including Lakeside High School, Briarlake Elementary School and Margaret Harris Comprehensive

School. Residents surrounding the defunct Medlock Elementary School were able to get a tower there removed from the proposal. Since then, parents near Margaret Harris and Briarlake Elementary have been publicly fighting the proposal, but board members and school system officials have essentially turned their backs, saying the T-Mobile contract is binding.

Drenner, however, has a background in radiation physics and said she believes the school system didn't act with necessary caution approving the deal. She said she has a bachelor's of science in radiation physics from West Virginia State University and a master's and a doctorate in environmental science. She also said she has worked as a radiation safety officer in California and calculated radiation exposure at a uranium enrichment facility in Ohio.

"I'm pro-nuclear, but I'm not pro-cell phone towers around schools," Drenner said. "We're used to seeing cell phone towers. However, the placement with regard to schools is an issue because, again, children... they're growing. As a parent myself, I would not want my child in a school where a cell phone tower is active."

Drenner said she admits there is legitimate research that says cell phone towers cause no adverse health effects, but with so many factors to consider, she said she believes it's hard to say for sure. The American Cancer Society says scientists agree it is unlikely that cell phone antennas and towers cause cancer. The organization also says there have been few human studies.

Regardless, Drenner said it's best for school system to avoid cell towers and not welcome cell phone companies like T-Mobile to construct them on school grounds.

"I'm not disputing cell phone towers. I'm disputing where they're being placed right now," she said. "The cell phone tower companies are going to say the distance... minimizes the exposure to the children. That's a valid argument, but they don't talk about the magnetic fields being created when the tower is being used. ... The chances of creating chromosomal aberrations [in children] increases."

Drenner's hearing will begin at 11:30am today in Room 415 of the Coverdell Legislative Office Building, which is located across the street from the Georgia State Capitol. Check back to North Druid Hills-Briarcliff Patch for live coverage.

Cell-Phone Towers and Communities: The Struggle for Local Control

by B. Blake Levitt

The Telecommunications Act of 1996 was the size of the Manhattan phone directory. At the time it was being debated, most people, including many legislators voting on it, thought it was only about complex deregulation schemes. But deep within its pages, in Section 704, lay a stealth clause about the siting of cell-phone towers that is creating a planning and zoning nightmare--and perhaps a public health problem, according to some scientists, journalists, and activists.

Inserted at the behest of the telecommunications conglomerates, whose representatives helped write the legislation, Section 704 states that although communities reserve their rights over the general placement, construction, and modification of towers, they cannot ban them outright. Nor can they unreasonably discriminate among providers, or set zoning regulations based on "the environmental effects of radio-frequency emissions, to the extent that such facilities comply with the FCC [Federal Communications Commission] regulations concerning such emissions." As for health effects on humans, the intent was to include them in the catch-all category "environmental effects," although no other industry, including the U.S. military, interprets the term in that way. Section 704 further states that all refusals must be "reasonable" and in writing.

Zoning officials today are caught between a rock and a hard place when it comes to siting cellular-phone towers or other antenna installations mounted on, or in, pre-existing buildings. Legally, they can't refuse them or, supposedly, design zoning regulations based on health effects, no matter how convincing the scientific evidence or how militant community members become. Any community that tries to challenge the safety of cellular towers based on the "environmental" effects of radio-frequency (RF) emissions stands to end up in federal court. Several communities already have.

The situation is dividing communities around the country, often pitting neighbor against neighbor when one is tempted by the licensing revenues of siting such a facility on their property, while adjacent landowners raise concerns about property devaluation and health endangerment. Communities used to be able to turn down such towers, but now this is no longer so.

Critics say it is the biggest land-grab in one industry's favor at the federal level since the buildout of the railroads at the turn of the last century. Others say it is a flagrant challenge to the Fifth and Tenth Amendments of the U.S. Constitution. And now those who are silenced at public hearings from speaking out about health effects point to First Amendment violations too. Legal challenges are currently making their way through the courts, the most promising of which was filed in federal court by a group of concerned citizens in conjunction with the Communications Workers of America and a group of "electrically sensitive" people, who have allergic-like reactions to electromagnetic fields. The suit charges, among other things, that federal health and safety agencies should be

held accountable for their failure to protect the public, and accuses the FCC of ignoring important studies on RF-radiation hazards, as well as overstepping its statutory authority in banning RF regulation at the local level.

But the issue may not be settled any time soon, despite a likely court ruling in the fall of 1998, widespread dissatisfaction at the local level, and increasing pressure on elected officials. The telecommunications industry, having poured millions of dollars into campaign contributions to both parties, has enormous influence. The scientific community is divided regarding safety, and the science itself--bioelectromagnetics--is arcane and complex.

What is it about cellular towers that makes people react so negatively? Is it just their intergalactic look? Or are the health concerns real? And why did the telecommunications industry fight so hard behind the scenes to disempower planning and zoning commissions? The answers go back decades, to the very heart of twentieth-century technology.

Simply put, many people love wireless convenience. There are an estimated 57 million cell-phone users in America alone. But no one loves the towers or antenna arrays that accompany the technology. The industry response to this dichotomy has been to create "stealth designs" for some installations, making them look like surrealistic pine trees, hiding antennas in church steeples, on barn silos and water towers, or designing large panels that attach to the exteriors of buildings.

But critics say aesthetics are a smoke screen obscuring the heart of the issue, which is medical. Concern about the safety of this part of the electromagnetic spectrum spans decades, fueling both government and industry research, although nowhere near enough, or of an appropriate kind. Nevertheless, that research has turned up disturbing results, and an abundance of controversy.

Radiation is a natural part of the universe. The electromagnetic spectrum is divided into ionizing and nonionizing radiation, with the former consisting of very short wavelengths, like X-rays and ultraviolet light, which have enough power to knock electrons off their orbits. These bands have the ability to do permanent damage at the cellular level, causing cancers and genetic mutations. Nonionizing radiation--emitted by powerlines, radios, TVs, cellular phones, microwave ovens, and many other sources--consists of longer wavelengths that can have less power, and has mistakenly been assumed to be harmless, apart from its ability to heat tissue. We have encircled the earth and infused the atmosphere with these nonionizing bands in ways that don't exist in nature--using abnormal exposure strengths and unusual characteristics such as alternating current, digital signaling, modulation, and odd wave forms--all without understanding the full bioeffects.

It has been known for decades that the human anatomy is resonant with--or acts as a perfect antenna for--FM radio frequencies, and that our bodies reach peak

absorption in the ultra-high frequency (UHF) ranges, right where television and cellular-phone transmissions occur. The FCC standards for radio-frequency emissions are based on thermal effects, or the RFs' ability to heat tissue, in the same way a microwave oven cooks food. But the case for *non*thermal hazards from RFs is substantial. Decades of research have found alarming effects: numerous cancers, immune system suppression, and birth defects, among others. Some research has found detrimental effects based on frequency alone, not on power density. And bioelectromagnetics researchers often note puzzling "nonlinear effects," which indicate that the most profound bioreactions occur at the lowest exposures. This body of research argues for fewer towers.

In 1992, Cletus Kanavy, chief of the Biological Effects Laboratory at the Kirkland Air Force Base in New Mexico, published a paper on RFs, stating that the information on nonthermal effects produced at levels below today's standards should not be ignored. Kanavy noted, "The principal...biological effects of greatest concern are behavioral aberrations, neural network perturbations, fetal tissue damage (inducing birth defects), cataractogenesis, altered blood chemistry, metabolic changes and suppression of the endocrine and immune systems..." Kirkland set an exposure standard 100 times more stringent than what the FCC uses for civilian exposures. The Johns Hopkins Applied Physics Laboratory did the same for its lab researchers.

Despite these findings, few appropriate RF studies, simulating long-term, low-level exposures, exist. Extrapolations from other scientific disciplines, as well as occupational and epidemiology reports, are therefore all we have to help us understand the consequences of this technology. Consumers point out that those who use the cell-phone handsets are engaging in voluntary exposures, even though handset safety also remains unresolved, according to the FDA and many industry insiders. But those who live near the towers are being forced into *involuntary* exposures, often after incurring great legal expenses in trying to stop the installations.

Municipal Agents often feel their hands are tied, but this may change as communities decide to draw the line. Some communities are talking about outright civil disobedience: "What are they going to do, send out the national guard and *make* us site towers?" said Richard Chevalier of Wellfleet, Massachusetts, a small New England town on Cape Cod where a church wants to site several antennas in its steeple, right in the heart of the compact historic district where centuries-old houses stand within a few feet of each other.

Other activists, such as Kati Winchell of Lincoln, Massachusetts, and Virginia Hines of nearby Concord, in conjunction with the Lincoln-based Alliance for Democracy and the Program on Corporations, Law and Democracy, are forming a national coalition to challenge Section 704 and put this technology on hold until it is proven safe.

Dale and Janet Newton of Marshfield, Vermont, found out that a neighbor

intended to lease land to a telecommunications company for a tower that would abut their maple sugar farm. They would be living and working near it 24 hours a day. The Newtons have since founded the Thistle Hill Alliance and taken out full-page ads in newspapers, prompting their legislators to restore the local rights taken away by Section 704. They have also set up a comprehensive website for RF issues.

The Newtons are among others paying serious attention in Vermont. In fact, Vermont seems poised for a rebellion that could have reverberations on the national level. That is what prompted the new chairman of the FCC, William Kennard, former chief counsel for the National Association of Broadcasters, to travel to Vermont for a mini-summit this year. (During that visit, Kennard said the FCC is "not in the zoning business," but he continued to reserve the right to pre-empt local laws nevertheless.) It was also U.S. Senator Patrick Leahy (D., VT) who wrote Senate Bill 1350 to reverse Section 704. The bill has temporarily been withdrawn, partly to protect it from being buried in the business-friendly Senate Commerce Committee. There is also a companion bill, H.R.3016, introduced by Bernard Sanders (I., VT), that is presently stuck in the Commerce Committee of the House of Representatives and may not see the light of day without significant voter pressure.

Last year, over 50 scientists and public-health officials in the Boston area, at the prompting of activist Susan Clark of Concord, signed a petition that was sent to the EPA, calling for a halt of the personal communications system (PCS) buildout in that city until further research is done. (The petition has gone unanswered.) Scientists and public-health officials in other areas are also calling for new research and caution before this wireless network expands. Even the industry researchers for the Wireless Technology Research group, the scientific arm of the Cellular Telecommunications Industry Association, went on strike for a year demanding that the industry indemnify them for the results of their research. Fifteen years earlier, the scientists on the committee responsible for writing the safety standards in effect today did the same.

Meanwhile, citizens report that the most vexing experience at the local level has been the silencing of their health concerns. Many municipal agents incorrectly interpret Section 704, assuming that since they cannot factor health into their final decisions, they therefore cannot broach the subject at all. Michael Petersen, of Lopez Island, one of the scenic San Juan Islands dotting the coast of Seattle, Washington, was ruled out of order on numerous occasions when he tried to introduce such information at public hearings over the sitingof a multi-island tower grid. So afraid of lawsuits were San Juan Island municipal agents that they wouldn't address the subject with him on the phone.

Sometimes, zoning regulations sidestep the issue by specifying that they are *not* taking health into consideration--an odd twist of logic since the purpose of zoning regulations in most state statutes is to protect the health, safety, well-being, and property values of a community.

When industry engineers show up to present applications for installations, they liken their technology to remote-control devices, such as garage-door openers or TV remote controls. They say that the power density 100 feet from antennas is

equivalent to that of these familiar devices, pointing out that power density decreases rapidly with distance from an antenna. But density is only one factor of radio-wave propagation among several variables that determine safety.

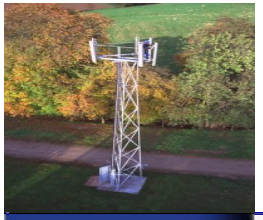
Industry representatives also point out that the RF emissions of cellular towers are far below the federal standards, which they often are. They liken the power output of the technology to 100- and even 25-watt light bulbs, hoping to assuage people's fears with familiar comparisons. What they leave out is that 100 watts is the power output *per channel*, and one antenna may host dozens of channels. As user demand increases, channels can be split. Plus, unlike 60-hertz light bulbs, these installations function in the microwave, UHF bands, where questions about safety go back to the 1940s and remain unanswered today.

Clearly, the situation is not as simple as the telecommunications industry would have us believe. Yet they continue to push at the federal level for pre-emption of local rights. Their more recent requests to the FCC include: declaring even temporary moratoriums illegal; disallowing communities from making companies prove they are in compliance with FCC regulations; and forbidding discussion of the health effects at local zoning hearings. They have also petitioned the U.S. Senate Commerce Committee, headed by Senator John McCain (R., AZ), to grant their services interstate commerce status--another way of overriding local control.

This industry sees a victory at the federal level as a victory in all 50 states. The last thing they want is to meet Everytown U.S.A., where the hard questions are being asked by those assuming the risks. Efforts should be made to rein in this industry until appropriate federal research is done--studies of long-term, low-level, nonthermal exposures like those encountered by people who live near such installations. Legislation that returns control to municipalities needs support. Zoning officials must be encouraged to keep installations away from people. This is not, and never was, just about the ugliness of towers.

B. Blake Levitt is a medical and science journalist, a former *New York Times* writer, and author of *Electromagnetic Fields: A Consumer's Guide to the Issues and How to Protect Ourselves* (Harcourt Brace, 1995), for which she won an award from the American Medical Writers Association.

This essay was originally published in the Autumn 1998 issue of *Orion Afield*. To order a copy of this issue, please visit The Orion Society Marketplace, call (413) 528-4422, write The Orion Society, 195 Main Street, Great Barrington, MA 01230, or e-mail us at orion@orionsociety.org.



Towers and Wireless Facilities
What a Community Can Control

1. Cost of Expert Assistance - Can be required to be paid for by Applicant (No Cost to Community)
2. No towers on 'Speculation', i.e. without a service provider who can prove the need for the facility
3. Verification/Determination of actual Need (How do you know that the Tower or Wireless Facility is really needed? You'd Probably be surprised at how many times there is no provable need.)
4. Location (You can prioritize preferred locations . . . without violating the prohibition against 'zoning them out')
5. Height (Does it really have to be as tall as the service provider says ? Almost never!)
6. Visibility
7. Required Co-location of facilities (to minimize the number of towers)
8. Number of Sites in the Community
9. Application Fees - Amount
10. Non-tax Revenue (Different than Fees)
11. Verification of compliance with the FCC's RF Emission Standards
12. Aesthetics/Appearance (It doesn't have to be recognizable as a wireless facility)
13. Lighting - can be prohibited
14. Setback
15. Signage
16. Screening
17. Structural Adequacy and Integrity
18. Site Security
19. Utilities (Underground versus Aerial)
20. Removal Bond (In the event the facility is ever abandoned)
21. Indemnification for use of municipally-owned property
22. Insurance
23. Interference with other communications & electronic devices
24. Inspection to assure that what is constructed is what was permitted

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City Denial of Cell Towers Upheld By Federal Appeals Court

By Richard A. Lehmann
WAPA Legislative Counsel
Boardman, Suhr, Curry & Field LLP

"Little Neck" is a residential neighborhood in Virginia Beach, Virginia. The neighborhood was served with analog cellular service through towers located outside the neighborhood. Digital then came to Virginia Beach. Digital providers said they could not cover Little Neck without a tower in the neighborhood. Each of the two digital competitors secured a lease with a church and conditional use approvals were sought for two towers, each 135 feet in height. The two analog providers jumped on the bandwagon and proposed to co-locate, one on each of the two towers.

The conditional use permit was approved by planning staff and plan commission but was turned down by the common council under the pressure of neighborhood opposition. The two digital providers and the church sued in federal court under the Federal Telecommunications Act. The federal district court ruled that the city had unreasonably discriminated against the digital providers and had failed to provide a decision in writing and supported by substantial evidence in a written record. The district court found, however, that the city had not prohibited service.

The federal appellate court overturned the decision, ruling entirely for the city.

The federal court of appeals found that the city had good land use reasons for denying the towers in an area that had no commercial uses and no pre-existing commercial towers. The fact that the denial had the effect of injuring the prospects of both of the new digital providers and the older analog providers meant that the decision did not discriminate in favor of analog and against digital. It is legitimate, the court finds, for the city to consider land use concerns regarding towers being established in a neighborhood that previously had no towers.

The court of appeals agreed with the district court that a city will usually be liable for prohibiting or having the effect of prohibiting the provision of cellular services only if it adopts a blanket ban. The court opens the door slightly to suggest that a series of case-by-case denials could be treated the same as an across-the-board ban if the pattern guaranteed that rejection of every application.

The district court had ruled that the city was required to state findings of fact and an explanation of the decision within the written record. In this case, the city sent the applicant a plan commission description of the towers, stamped "denied" and barebones minutes of the council meeting. The appeals court defines substantial evidence to mean "relevant evidence such that a reasonable mind might accept the evidence as adequate to support a conclusion." In this case, although there were no technical reports supporting rejection, there was public testimony indicating widespread opposition and this amounted to adequate evidence. The court noted that industry representatives will have expert testimony and fancy exhibits. The generalized opinions of average citizens are sufficient weight to support a denial decision. The city need not adapt findings or reasons.

AT&T Wireless PCS, Incorporated v. City Council of the City of Virginia Beach, 1998 WL 553666, 4th Cir. (VA).

FOR IMMEDIATE RELEASE
Office of the Governor
March 1, 2002
Contact: Rusty Cheuvront or Terri Giltner (502) 564-2611

Governor Patton Endorses Local Control of Cell Towers

Encourages citizens to support HB 598

LOUISVILLE, KY., (March 1, 2002) – Governor Patton used an unusual backdrop today to support his desire to give local communities control over the location of cell towers. Standing in Louisville homeowner George Krauser's backyard with State Representative Steve Riggs and other members of the Louisville legislative delegation, he faced a homeowner's worst nightmare – a large cell tower.

"Standing in this yard is really all the explanation that is needed to demonstrate the importance of this issue," stated Patton. "Cell phones have become a necessary part of our lives and we need to accommodate the need, but we need to do so in a manner that preserves the unique, natural beauty of our communities and respects the rights of individual property owners."

House Bill (HB) 598, sponsored by Representative Riggs, shifts the decision on where cell towers are located back to local governments. Currently Kentucky is the only state that allows the Public Service Commission (PSC) to regulate cell tower sites and to overrule the decisions of local planning and zoning boards on this issue.

HB 598 removes the PSC from the approval process for cell tower locations in areas under the jurisdiction of a planning commission. However, the PSC will still have siting review over cell towers in communities with no planning commission.

"This has been a long and important battle," stated Riggs. "I have always maintained it would be best to have this decision made in the local community."

The cell tower legislation is one of four environmental bills that are part of the Governor's environmental agenda that is designed to preserve and strengthen Kentucky's natural environment while accommodating future growth. Other aspects of the Governor's legislation include quality or smart growth, the siting of power plants, solid waste and highway litter, and the Pine Mountain Linear State Park.

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Public Employees for Environmental Responsibility News Release

For Immediate Release: May 4, 2006
Contact: Carol Goldberg (202) 265-7337

OSHA FINDS YELLOWSTONE CELL TOWER EMITS EXCESS RADIATION — Popular Hiking Spot Has Unsafe Radio Frequency Radiation Levels

Washington, DC — The cell tower at Mount Washburn within Yellowstone National Park emits radio frequency radiation in excess of federal safety standards, according to agency documents released today by Public Employees for Environmental Responsibility (PEER). In an email about plans to expand cell phone coverage in Yellowstone, the park safety officer warned his chain-of-command that "we are pushing the edge of safety up on Mt. Washburn."

Located near the center of the park, Mt. Washburn is a popular hiking destination drawing an estimated 10,000 visitors a year. In addition, the cell tower is co-located with a fire lookout station.

In a June 10, 2004 report, Brandon Gauthier, the safety officer for the park, described a survey conducted by a federal Occupational Safety and Health Administration (OSHA) official that found radio frequency (RF) radiation levels at Mt. Washburn in excess of the general population safety standard established by the Federal Communications Commission (FCC). Gauthier recommended that warning signs be installed and that any "future installations of antennas on Mt. Washburn lookout must be closely evaluated to insure the safety of employees and visitors."

Several months later, on March 22, 2005, Gauthier again cautioned about "the safety implications of antenna installations" in an email regarding an upcoming meeting with telecom industry officials to develop a plan to dramatically increase the level of cell and microwave communication coverage in the park. At that meeting, held on March 31, 2005, one park official attending the meeting wrote discussion notes about the need to address "safety issues (RF) & bring [the park] back into compliance."

"The fact that Yellowstone managers need to be repeatedly reminded about the dangers to their own employees as well as visitors is less than confidence inspiring," stated PEER Executive Director Jeff Ruch, whose organization has been drawing attention to the proliferation of cell towers throughout the national park system and their negative consequences in terms of views, solitude and commercialization. "The panoramic locations that cell phone companies crave to maximize their towers' coverage may also be putting those who visit these vistas at risk."

Despite Gauthier's warnings, park officials are moving ahead with an industry-designed plan to nearly double cell tower installations in Yellowstone. The plan also envisions bringing radio and TV signals into the park, as well as installing broadband wireless internet access.

Besides the FCC, some 24 states have radio frequency radiation standards. While OSHA does not have a specific standard on RF radiation, it enforces protective clothing and warning sign precautions as part

of its “general duty clause” responsibilities to keep workplaces safe. The carcinogenic, reproductive and neurological health effects of radio frequency radiation are poorly understood and are the subject of much ongoing research.

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Read the email from the Yellowstone safety officer

View the 2004 OSHA report on RF levels at Mt. Washburn

Look at the Mt. Washburn tower

See the industry plan to boost cell phone coverage at Yellowstone National Park

Learn about the dangers of radio frequency radiation

Vermont church asking to get out of cell tower contract

By Wilson Ring, Associated Press

MONTPELIER, Vt. — The Catholic Church is asking Verizon Wireless to let it out of a contract to install communications equipment in the two steeples of St. Mary's Star of the Sea church in Newport.

But Verizon Wireless has told the church a contract is a contract and is continuing with its plans to install three transmitters and receivers in the two bell towers in the church, located at one of the highest points in the city, church officials say.

Verizon Wireless officials and church officials are planning to meet next month with St. Mary's parishioners to try to allay concerns that the communications equipment could pose a health threat to people in the church and neighbors.

St. Mary's pastor, the Rev. Yvon Royer, said Monday that when the idea of installing the communications equipment in the church was first discussed there was no opposition. It was only after the contract was signed and plans were moving forward that the opposition surfaced.

"There are indeed a group of people who are very much against it," Royer said. "We hate to have even one person alienated. At the same time we know we can't always please everybody."

Verizon Wireless officials refused on Monday to discuss the specifics of their relationship with the Newport church until after the March 11 meeting, said New England spokesperson J. Abra Degbor.

"We always make ourselves available to answer questions," she said.

Instead, she said Verizon Wireless had always worked to locate its equipment in ways that will have as little impact as possible on the areas around the equipment.

The most serious concern raised by St. Mary's church members was that the radio waves that will be reaching the antennas in the steeples could threaten human health. Others have expressed concerns about the aesthetics of the equipment or the issue of installing for-profit communications equipment in the church.

Linda Curtis, a mother of three who lives about 100 feet of the church, is one of the opponents.

"Ninety percent of the church didn't know," she said. "That bothers me a lot."

She said she was concerned that the radio waves could hurt the people who live in the neighborhood and the children in a nearby school. She said the radiation also was thought to cause sleep disturbances and memory problems, but there was no proof.

"There's no 100% on either side, here," she said.

"If they do go up we won't stay here. We will leave the (Newport) church and the neighborhood," she said.

"This is my own church, that I've been in all my life," she said. "My husband converted to that church. It holds a lot for me. It's a hard pill to swallow. It's tough to fight the church. It's tougher to fight Verizon."

It was because of the intensity of the opposition that the Diocese of Burlington, which legally owns the church and signed the contract last year, asked Verizon if they could get out of the deal.

"We recognize we did sign the contract," said Diocese Vicar General Rev. Wendell Searles. He said he did not know when Verizon Wireless planned to install the equipment.

Royer, a Newport Center native who returned to Newport as a priest in October after the contract was signed, said the parish could use the $15,000 a year it would receive from Verizon Wireless to fund social programs and the church youth group.

Royer said St. Mary's has about 900 member families. Of those about 30 to 40 are upset with the plans to install the communications equipment in the church.

"It was out of respect for the group," Royer said that the diocese asked Verizon Wireless to reconsider. "We hate hard feelings. Verizon has come forth with their answer. We have to do everything we can to lessen hard feelings."

Searles said Verizon Wireless officials feel there is no basis to peoples' concerns about the health effects of the equipment. That would be discussed at the March meeting.

Royer said that Verizon Wireless first approached the church about locating cellular equipment in the church about 18 months ago. The building occupies a high point in Newport, overlooking the downtown and Lake Memphremagog.

"Our position at the diocese is we have no objection provided the local parish agrees with it," said Searles. "They decided they wanted to go for it."

Curtis said that once people found out they were opposed. She said she didn't know what she'd do Verizon refused to back down.

"We're just hoping Verizon will do the right thing," Curtis said.

Find this article at:
http://www.usatoday.com/tech/news/2004-02-03-repent-verizon_x.htm

freep/news/oakland

Resident battles cell phone towers

Next target: Plan for West Bloomfield High

January 11, 2001

BY JOEL THURTELL
FREE PRESS STAFF WRITER

Last month, Hartley Harris spearheaded a group of West Bloomfield home owners protesting a cell phone company's plan to install an antenna in a church near their subdivision.

When the township board denied Sprint PCS' antenna plan, Harris decided to gun for yet another cell antenna.

Harris, president of Maple Woods Homeowners Associations 2, 3 and 4, which encompass the area near Maple and Orchard Lake roads, said Wednesday that he's aiming to scuttle a plan for a cell tower at West Bloomfield High School.

But Harris' effort could place the township in court -- again.

Sprint sued West Bloomfield last summer for refusing an antenna it asked to install at the Robin's Nest shopping center at the northeast corner of Northwestern Highway and Orchard Lake Road. The federal suit is pending.

Will Sprint sue a second time?

"I don't know the answer to that," said Sprint spokesman Mark Elliott.

Sprint sought to mount the antenna on the steeple of Covenant Baptist Church on Maple west of Orchard Lake Road.

Township trustee Stuart Brickner said officials listened to Harris and his neighbors' complaints, but "it wasn't him that scuttled it."

Trustees just didn't see a need for one more tower, Brickner said.

But Harris, who has health concerns about the tower plans, said Wednesday that he has received lots of calls from residents who support a limit on cell tower construction.

"Let's not have antennas and towers every two or three miles," Harris said. "Just because a big company comes to the board and says, 'You do this or else,' doesn't mean the board has to do it. The board has to stand for something.

Protesters topple mobile phone masts as health scare spreads

By Daniel Foggo
Last Updated: 10:51PM GMT 29 Nov 2003

Activists have begun tearing down mobile-phone masts around the country, as public concern over the health impact of the radiation they emit continues to grow.

The destruction of the masts - as many as four in a single week - signals a dramatic stepping up of the campaign to stop them being placed on top of, or close to, people's houses.

Earlier this month, masts were brought down at Wishaw and Dudley in the West Midlands, Crosby in Merseyside and Tiverton in Devon. At least four have also been brought down in Northern Ireland in recent months.

Although government advisers say there is no evidence that the masts threaten peoples' health, those living near them have complained of illnesses ranging from cancer to motor neurone disease. Some scientific studies have suggested that the radiation produced by the aerials has an impact on sleep patterns and could have health implications.

Lisa Oldham, the director of Mast Sanity, a group that campaigns against the masts being sited close to communities, said: "We don't condone the use of criminal acts to bring down the masts, but this does suggest the level of protest against them.

"We are swamped with people protesting about them. There are thousands of groups trying to get masts moved or trying to prevent new ones being placed near their homes."

At Wishaw, a village near Sutton Coldfield, a 74ft mobile mast was pulled down in the early hours of November 6 by a protester using a rope and haulage equipment. The mast, which was put up 10 years ago on a narrow patch of land between a field and a livery yard, has been blamed for causing a cluster of cancers in the area.

Among those living in the 18 houses within a 500-yard radius of the mast there are 20 cases of serious illness, including cancers of the breast, prostate, bladder, lung. One man is dying of motor neurone disease. Many of the people affected are in their thirties and forties.

Since the mast was toppled, residents have refused to let the network provider, T-Mobile, replace it and the situation has now developed into an uneasy stand-off.

Eileen O'Connor, who lives within 300 yards of where the mast used to stand, had breast cancer two years ago at the age of 38. She noticed that many of her neighbours were attending her hospital with similar problems and set up Sutton Coldfield Residents Against Masts (Scram).

"We have absolutely no idea who took the mast down, and obviously it was a dangerous and inadvisable thing to do," said Mrs O'Connor, who runs an internet advertising business. She and her children, who also suffered ill-effects, sleep under copper-mesh "mosquito nets" in an effort to deflect any mobile phone radiation.

"The first I knew about it was when I looked out of my window in the morning and couldn't see the mast. Apparently the company said that they lost the signal at 12.30am. Someone had unbolted the mast and pulled it over using a rope."

Clare Villanueva, a solicitor and Scram campaigner in Wishaw, has written to Crown Castle, the company that owns the land on which the mast stood, saying that it cannot legally gain access to the site to replace the mast because its path crosses someone else's land.

Residents are now carrying out a 24-hour vigil to ensure that a new mast is not set up, and both sides are paying for security guards to patrol the borders of the land. The locals have suggested an alternative location away from habitation for T-Mobile to use, but this has been rejected by the company.

A spokesman for T-Mobile said that the police had been called to investigate. "It defies belief that nobody in Wishaw noticed when the mast was coming down," he said.

A spokesman for the Mobile Operators' Association, which represents the five network providers on health and planning issues, said that all its members operated within accepted World Health Organisation guidelines for radiation emissions and there was no proof that masts caused health problems.

She added: "The number of masts being brought down is very small in the overall scheme of things. However, it is certainly worrying that people are taking direct action, because they could seriously hurt or even kill themselves."

Related Content

Green light for radio masts (/news/uknews/1441849/Green-Party-fails-to-stop-erection-of-radio-masts.html)

Phone mast risk inquiry (/news/uknews/1419235/Inquiry-into-risk-from-phone-masts.html)

Phone mast 'causing cancer' (/news/uknews/1416360/Mobile-phone-mast-is-cut-down-in-cancer-alert.html)

External Links

Clarification of mooted relationship between mobile telephone base stations and cancer - World Health Organisation (http://www.who.int/mediacentre/statements/statementemf/en/)

Mobile telecommunications and health - Department of Health (http://www.doh.gov.uk/mobilephones/)

Mast Sanity (http://www.mastsanity.org/)

Mobile Operators Association (http://www.mobilemastinfo.com/)

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Gotham Gazette - http://www.gothamgazette.com/article/communitydevelopment/20040527/20/992

Mobilizing Community Concerns Against Mobile Phone Antennas
by Mark Winston Griffith
27 May 2004

The residents of 33rd Street in Astoria, Queens weren't looking for trouble. It literally fell into their backyard.

In June of 2003 a curious set of engineering plans floated from the roof of a building and into the backyard of Mario Bazzolo, setting off a chain of events that could have long-term repercussions for the expansion of wireless technology in New York. As fate would have it, Bazzolo, an electrical engineer, immediately recognized what the details of the blueprint represented and in reporting his findings to his neighbors confirmed what some had suspected all along: That recent construction on the roof of 32-42 33rd Street was not the work of a cable television company, as one of the men working on the roof had falsely claimed. The antennae which looked onto surrounding homes and families on this quiet residential street were in fact part of a base station transmitting radio frequency (RF) signals used for mobile phones.

Since that day in June in 2003, the residents living in and around 32-42 33rd Street, organized now as the Astoria Neighborhood Coalition, have been fighting to have these antennae removed. In doing so, they have become lay experts on "non-thermal ionizing radiation" (radiation that does not heat tissue) and have discovered that there are over 200 antennae located within a mile and half radius of their block, primarily on residential buildings. From there they have taken on the wireless phone industry and New York City zoning officials while prompting two legislators to introduce bills that would begin to more closely regulate the mounting of cell phone antennae in New York City neighborhoods and state-wide. Perhaps most importantly, the Astoria Neighborhood Coalition has inspired a growing city-wide effort to rein in what some consider to be the unchecked proliferation of cell phone antennae across the city, and to bring public awareness to potential health risks posed by their radiation emissions.

The cell phone industry, mostly in the form of wireless service providers and communication technology companies, real estate developers, construction companies and others with a vested interest in a multi-billion dollar business, say these fears are unfounded. In extolling the safety of cell phone base stations, they also emphasize the importance of cell phones in times of emergency (almost ten thousand 911 calls are made from wireless phones in New York everyday) and point to American society's growing reliance on cell phones.

Debating Possible Health Risks

Cell phones started appearing regularly on New York City streets in the early 1990s. Today there are approximately 10.5 million wireless phone subscribers in the city alone. More to the point, there are thousands of cell phone antennae throughout the city, although no one knows the exact number or even how to get an accurate count. Yet while cell phones have become a highly visible and ubiquitous feature of modern life, the mobile phone industry's rooftop infrastructure remains largely unnoticed by the general public. In fact, there was little evidence that the public cared where cell phone towers were placed until there was political opposition to recent attempts by Schools Chancellor Joel Klein to rent public school rooftop space to cell phone companies.

Cellular phone facilities typically consist of three primary parts: the antenna, the base station, and the equipment. Antennae send and receive signals to and from cellular phones using RF radiation at frequencies between 800 and 1990 megahertz (MHz) which is greater than most FM radios, cordless telephones, and television broadcasts, but less than microwave oven frequencies.

At the heart of the dispute between organizations like the Astoria Neighborhood Coalition and the New York Wireless Access Coalition, a wireless industry advocacy association, is their interpretation of research that has been done on the safety of these antennae. While the radio frequency used by cell antennas may seem no more dangerous than a microwave oven, it is the constancy of the emissions and the proximity of antennae to humans that has raised questions among scientists and prompted countless health studies. Most of the research done so far is limited and inconclusive at best, neither denying nor concluding that cell phone antennas pose a public health threat. In fact, at a recent City Council hearing, both wireless phone advocates and their detractors quoted excerpts from the same World Health Organization (WHO) fact sheet to champion their cause.

The wireless phone industry, public health officials and the Federal Communications Commission (FCC) all point to the fact that there is no smoking antenna, no proof that the radiation produced by cell antenna radio frequencies constitutes a real health risk. As a result, wireless advocates maintain there is no justification for trying to impose regulations on the cell phone industry.

Anti-proliferation organizers and members of the Astoria Neighborhood Coalition acknowledge that cell phones are important mainstays in today's society, but argue that the need for more scientific research is reason enough to at least monitor cell phone antennae construction. Evie Hantzopoulos, a spokesperson for the Coalition who freely admits to being an avid cell phone user herself, points to the city's

experience with asbestos as a cautionary tale of how medical science is often years behind the growth and use of new technologies, innovations and materials.

The research debate is a highly complicated one, not only because opinions within the scientific community - some of which has been underwritten by the cell phone industry itself - vary greatly, but because no one has yet been able to complete a long term study that accurately simulates real life conditions and antenna exposure.

While Jessica Leighton, the Assistant Commissioner of the New York City Department of Health testified at City Council hearings that antennas were “unlikely” to pose a health risk, she also admitted “it is fair to say that some questions have not been conclusively answered. While more study may be warranted, it would take an enormous amount of time, money and expertise…Entirely different training, expertise and professions are required to evaluate emissions, exposure and health outcomes.” Leighton concluded that “Better studies are based on very large populations, followed for many years into the future… Short-term health studies conducted locally are not likely to shed meaningful light on these issues.”

The Fight In Astoria

In addition to the seemingly divine hand that delivered the errant blueprints to Bazzolo’s doorstep in Astoria, it took a very aggressive community organizing campaign by the coalition for the issue of cell tower proliferation to take on a broader city-wide profile. After learning that the owner of 32-42 33rd Street was renting rooftop space to T-Mobile, residents discovered that the rooftop was accessible to the residents of the building, lacked proper signage and that three of the antennae were openly exposed, within mere feet, to people living in the adjoining building - all in violation of Federal Communications Commission (FCC) guidelines.

In response, the coalition quickly produced a 500 signature petition demanding that the antennae be removed, called on their public officials to get involved and requested an inspection of the base station from the FCC. In the process they also learned that securing the legal right to have the antennae dismantled would not, however, prove to be so easy.

Normally, telecommunication companies are required to apply to the Board of Standards and Appeals and then appear in front of a public hearing before they can build in a residential neighborhood. However in 1998 Deputy Commissioner of Buildings Richard Visconti issued an order that exempted cell phone companies from this long and expensive neighborhood process. Visconti explained his action by saying, “The department recognizes that the cellular telephone has become a prevalent form of communication essential to the public interest. As such, those

companies wishing to erect cellular antennae and install related equipment are to be treated with the deference afforded other public utilities."

As such, cell phone carriers operate under very little control or oversight, not only in New York, but statewide. According to an open letter issued by the Astoria Neighborhood Coalition, "telecommunication companies themselves are not required to inspect or monitor the sites. The FCC issues a blanket license for a geographical area. As long as the company self-certifies that the site meets federal guidelines, they can put up an antenna sites wherever they wish...[N]o agency on the local, state or federal level tracks where these antennae are being sited."

Because the New York State Public Service Commission is regarded as a competitive market, they do not regulate wireless companies. Furthermore, local and state governments across the country are prohibited from using health concerns as a guiding principle in the zoning of cell phone antennae and base stations because, the FCC reasoned in the 1996 Telecommunications Act, there is no solid evidence linking cell phone technology with heath risks.

In the meantime, the coalition has questioned the validity of the exemption that was granted the wireless phone industry and contemplates a class-action lawsuit. Hantzopoulos asserts that Visconti's action was "in violation of the New York City Charter" and he "had no authority to issue this exemption".

The coalition has already been successful in compelling T-Mobile to remove three of the nine antennae, the ones that directly exposed residents in the adjacent building. By the time the FCC arrived in October of 2003 to inspect the site, it represented perhaps an even more significant victory for the coalition: The Queens Chronicle reported it was the first inspection of a New York City cell phone antenna ever conducted by the FCC. What arguably should have been routine, was, in fact, a landmark event for the agency that took months and a great deal of applied political pressure from Queens to achieve. As a result of this experience, Hantzopoulos surmised that when it comes to wireless technology, the "FCC has neither the expertise nor the capacity to ensure public safety".

Legislative Action

Indeed, the coalition's allies have proven to be closer to home. A target of the coalition's advocacy, Astoria City Councilmember Peter Vallone, Jr. has introduced a bill that, if passed, would mandate that the city maintain a list of where cellular phone antennae are erected, thus giving the public the ability to at least track antenna locations. Vallone has called for the Department of Health and Mental Hygiene to study the long-term effects of living and working near multiple antennae and base

stations and has already prompted the City Council Committees on Health and Housing and Buildings to hold hearings in April of 2004 on the proliferation of cell phone antennae.

Astoria Assemblyman Michael Gianaris has been pushed even further in sponsoring Assembly Bill 9897, which is designed to "promote the responsible and efficient placement of wireless facilities in residential areas". Specifically, the legislation would establish a four-month moratorium on the construction of wireless facilities, allowing time for the establishment of a new siting board that would ensure certain criteria are met before a wireless tower is erected.

Gianaris' legislation would also mandate a study on the health effects of cell phone tower emissions; require companies to demonstrate the need for each wireless facility; require written notice of the facility to residents living within 500 feet of the proposed tower; call for public hearings on specific construction proposals; and require that cellular phone facilities conform to the aesthetics of the surrounding neighborhood.

The cell phone industry has not taken this lying down. In her testimony before the New York City Council hearings, Laura Altschul, Director of National Siting Policy at T-Mobile USA Communications, said that while these legislative initiatives are "well intentioned, they have the potential…to threaten the city's wireless communications systems and undermine the advances New York City has made in telecommunications to date." In addition to emphasizing the important role that cell phones play in originating 911 calls, Altschul argued that the tracking of cell phone antennae could be exploited by terrorists to threaten homeland security.

A Growing Movement

But the protest genie may have already escaped the bottle, both locally and nationally. For instance, several independent grassroots campaigns in San Francisco aimed at halting the placement of wireless antennae in residential areas joined forces in 2000 under the banner of the San Francisco Neighborhood Antenna-Free Union (SNAFU), a city-wide coalition of individual residents and neighborhood organizations. And taking the lead from the Astoria Neighborhood Coalition, community boards #1 in Queens and #7 and #8 in Manhattan have passed resolutions calling for the study of potential cell antenna health risks, while boards #3 in Manhattan and #10 in Brooklyn have recently placed the matter on their agendas.

In the meantime, with three antennae removed, but six remaining on the roof of 32-42 33rd Street, the Astoria Neighborhood Coalition continues its fight and has become the leading grassroots voice for people across New York desperate for information

and advice regarding cell phone antennae. Hantzopoulos says that she and the coalition members have received countless emails and phone calls from people facing their own dilemmas: Co-op boards and landlords wondering whether to accept money from companies seeking to put antennae on their roofs; cancer victims questioning their own close exposures to antennae; residents, grassroots organizations and elected officials considering how to mount their own local anti-antenna campaigns; even a parent trying to decide whether to buy a house on the coalition's block. "This is going to be a major public health issue in the years to come," Hantzopoulos said. "The public is just beginning to learn about it and they will be outraged."

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INTERNATIONAL ASSOCIATION OF FIREFIGHTERS (IAFF) VOTES TO STUDY HEALTH EFFECTS OF CELL TOWERS ON FIRE STATIONS

Call for Moratorium on New Cell Towers on Fire Stations Until Health Effects Can Be Studied

Boston, MA – August 24, 2004 – Firefighters returned to their home stations throughout the United States and Canada following last week's IAFF convention after passing a resolution to study the health effects of cell towers placed on the fire stations where they work and live.

Added to the resolution was an amendment calling for the IAFF to support a moratorium on the placement of new cell towers on fire stations until the completion of the study.

In many parts of the U.S. and Canada, the wireless industry has sought to place cell towers on fire stations because of their strategic locations. Fire stations tend to be located in densely populated areas, many of them near main highways, making them attractive locations for cell towers to maximize coverage. The wireless industry is not alone in the benefits of placing cell towers on these stations. Municipalities receive revenue from the wireless companies in exchange for locating the antennas on fire station property.

Lt. Ron Cronin of the Brookline, MA Fire Department and Acting Lt. Joe Foster of the Vancouver Fire Department and Vice President of Vancouver, B.C. Local #18 spearheaded the passage of the resolution.

"Some firefighters with cell towers currently located on their stations are experiencing symptoms that put our first responders at risk. It is important to be sure we understand what effects these towers may have on the firefighters living in these stations," Cronin explained. "If the jakes in the fire house are suffering from headaches, can't respond quickly and their ability to make decisions is clouded by a sort of brain fog, then entire communities they are protecting will clearly be at risk. No one wants the guys responding to their family emergency to be functioning at anything less than 100 percent capacity. "

A recent pilot study of six California firefighters, first publicly revealed at the IAFF convention by medical writer and study organizer Susan Foster Ambrose of San Diego, CA, raises concern about the safety of fire fighters working and sleeping in stations with towers.

The study, conducted by Dr. Gunnar Heuser of Agoura Hills, CA, focused on neurological symptoms of six firefighters who had been working for up to five years in stations with cell towers. Those symptoms included slowed reaction time, lack of focus, lack of impulse control, severe headaches, anesthesia-like sleep, sleep deprivation, depression, and tremors.

Dr. Heuser, along with Dr. J. Michael Uszler of Santa Monica, CA, used functional brain scans - SPECT scans - to assess any changes in the brains of the six firefighters as compared to healthy brains of men of the same age. Computerized psychological testing known as TOVA was used to study reaction time, impulse control, and attention span.

Disturbingly, the SPECT scans revealed a pattern of abnormal change which was concentrated over a wider area than would normally be seen in brains of individuals exposed to toxic inhalation, as might be expected from fighting fires. Dr. Heuser indicated the only plausible explanation at this time would be RF radiation exposure. Additionally, the TOVA testing revealed among the six firefighters delayed reaction time, lack of impulse control, and difficulty in maintaining mental focus.

Because of increasing complaints among firefighters with cellular antennas on their stations coupled with the California study showing damage among the six firefighters tested, a group of five individuals spread across two provinces and three states worked with Southern California firefighters to draft the resolution put before the IAFF membership last week. Lt. Ron Cronin and Acting Lt. Joe Foster were joined by Dr. Magda Havas of Trent University in Peterborough, Ontario, Vermont-based Janet Newton - president of the EMR Policy Institute, and Susan Foster Ambrose.

“It is imperative to understand that in spite of the build out of an extensive wireless infrastructure in the U.S. and Canada,” explained Ambrose, “we have no safety standards for cell towers. There are only regulatory standards, not proven safety standards. The Heuser Study in California calls into question whether or not we are sacrificing the health and well being of our countries’ first responders for the convenience of a technology we’ve come to rely upon.”

Considering approximately 80 percent of the firefighters attending last week’s convention voted in favor of a medical study with the spirit of a cell tower moratorium attached, it appears firefighters throughout the U.S. and Canada share that concern.

This study has far-reaching public health implications in view of the fact that the wireless industry pays local governments to place cell towers, not only on fire stations, but also on top of schools and municipal buildings.

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# # #

* Testimonial of Dalana MCaren - Alex Gabor's Story - EMF Hypersensitivity - Tower Trauma In Canada (22/11/02)

Tramès per **Klaus Rudolph (Citizens' Initiative Omega)**

Testimonial of Dalana MCaren

January 22, 2000

In September of 98, I moved into a 21-storey government subsidized building for seniors. The apartment that was my placement is on the 20th floor. I immediately began experiencing symptoms of a dizzy-off -balanced feeling, headaches which were constant, severe insomnia, profuse nosebleeds, sweating and a feeling like I was cooking. I wasn't able to concentrate, I would often find myself, throuhout the day, feeling "out-of-it", not remembering. I felt drained out and more than half dead. I had anxiety attacks and breathlessness, felt agitated, restless and my joints hurt and my eyes were sore. I would awaken most often around 3 AM very suddenly feeling "cooked", anxious and like I had to go out. My chest felt pressured and I would either lay there untill morning with all these things going on, or often I just get up and walk the steets where I would feel refreshed, calm and clear headed.

At first I put it down to stess from a difficult year with a major move. But in November of 98 ,my sister and her husband sent me a plane ticket to visit them for a month in the Toronto area. I felt good there, slept wonderfully, had lots of energy, was clear headed, focussed, had no memory problems and felt normal,
tranquil and very cheerful.

I returned in December and immediately the nosebleeds and all the symptoms returned. I continued suffering the above symptoms (plus many other ones) until I went away fot 6 weeks in the summer to Vancouver Island to visit my father. Again I felt normal with lots of energy and focus inspite of it being a stressful time with my father being ill and in hospital.

I returned and again - all the symptoms. By this time I had become aware of the effects of microwave towers and telecomunications instalations through a magazine article and also through talking to a repairman from the cable TV provider. He had come because I was having a lot of interference with my TV.

I then began to pay attention to the fact that on the next floor but one - on the roof top of the building I am in, there are at least 25 telecomunications towers and microwave transmitters and the top of the building looks like a porcupine!

I myself was becoming increasingly more distressed now with occasional bouts of rage, feeling at times like I was going crazy and had lost control of my brain. I was having daily bouts of crying for no apparent reason and yet as soon as I would leave the apartment, I felt fine.

Then again, this past 3 months, I went away twice. Once for a month back east again and the last time from 10th Dec. 99 to the 06 Jan. 2000. Upon returning on the 06 Jan., within moments of being on the upper 20th floor, I felt a dizzy-off-balance feeling and within 12 hrs I suffered 2 profuse nose bleeds and couldn't sleep at all.

It is my opinion and experience that since Christmas the frequency of use of these transmitters has increased. It feels like like the walls are buzzing and I have had very little sleep. I am having to walk the streets at night and visit other people's homes during the day in order to write letters or do anything that requires concentration.

Last week, I had 2 visitors on separate days. Both within a minute or so of being in my apartment said they felt blocked in their heads, began experiencing headaches, that "dead feeling". They mentioned they felt agitated and restless and could hear a buzzing, high pitch vibration and had to leave before a half hour was up. I certainly confirmed that wasn't "just me". Both telephoned me later and said that within 5 minutes of leaving they felt back to normal.

I would also like to note that my plants are becoming shrivelled looking and are not growing well. I happen to have a green thumb. For example, I think we are all familiar with Poinsettia's and that their leaves are largish. Well mine are all tiny-only about one half inch to one inch in length and they sort of keep their leaves pointing downward, not out.

I am truly exhausted of this. I only hope that, first of all I can find another place to live that is affordable because I am on a disability pension hence being in government housing and secondly that I can even "get-it-together" enough to pack up and move.

I hope my story helps in some way.

PS: I am a retired school teacher, a massage therapist and an exceptional artist. I haven't been able to do any art since I moved in to this place.

Yours Truly
Dalana MCaren

Alex would like people to know his story

bearvan55@yahoo.com

Alex Gabor's Story
By **Alex Gabor**

Here is my story, how life turned to hell - if you care to spend a few more minutes reading it.

Last year a major phone company put up a cellular base station on the top of the three story building where we leased an office. During the few weeks while the construction was going I noticed nothing particular. However, one day I felt pain in my shoulder and back, somewhat similar to the feeling when influenza attacks you. For next two days during the weekend I stayed home and the pain was gone. Monday in the office the pain started again, going home by the evening it subsided. Next day it started again in the office and within a few days the pain was so strong, that I had to leave the office early. Staying away helped.

When I started thinking, I realized, that the worker who were working on the installation of the cell station left a day earlier than my first day of pain, so very likely the station started transmitting on the day when I first began experiencing the pain. No other employee complained, however I managed to move the office to a new location, where for a couple of months I was OK. One day, however, my pain started again. This time the collar bone hurt, the spine (maybe it was the muscles around it) and the breasts. I couldn't understand why, till I saw a cell- tower. It was at the end of the long street, as later measured with my car at 0.8 miles distance. I work long hours in the office, so the pain stayed with me even after I went home.

A month later I traveled on the east coast. Within a two weeks time period I stayed in the car most of the time, towards the end of the trip the pain was very mild. The last night of the trip I felt stronger pain again. In the morning when I woke up and checked the surrounding area, I found cell towers on both sides of the hotel within a 1.5 mile distance.
This strengthened my belief that I must be sensitive to whatever radiation they emit.

When I arrived at home, and went to work, within two days the pain came back. In my profession I was able to work from home, so that was my choice, and for a few months everything went well, no pain at all. Till one day the flu like pain came back, that got worse the next few days. I drove around, saw no cell tower, there was not even any two story or three story office building on which they could have put a cell base station.

Maybe something is wrong with me - I thought- and my theory of cell tower, base station effect is false. A few days later while jogging, I discovered at the side of the highway on one of the steel structures which holds the high voltage power lines an antenna similar to the one that we had on our first office building. That was 0.3 miles from our home in straight line. In the meantime the pain got stronger and felt like the intensity moved within the body between the shoulder and

the pelvic area.

I went to a doctor, describing my situation and asked to be examined as to whether I may have an illness that I do not know about and blame it on these cell towers. My tests and my general checkup showed full health, however in the eye of my doctor I was able to see a concern about my mental health. I knew that I didn't lose my mind, however I started having doubt about it, as nobody in my household felt anything, nor relatives who lived in the same area.

One day I read an article about various groups who are concerned about the effect of cellular towers, the reported mentioned names. I called one of them, who had invited an expert from New Zealand on a meeting with the phone company representatives. I asked him if he has ever heard something similar to my case. He said yes, more than one. He gave me the name and phone number of one person, to whom when I described my symptoms his response was, that he had identically the same. He moved out of the city where he lived and found a place in the country where he felt good, but saw as the phone companies were closing in on him with the towers. He heard of three more people with similar symptoms.

I drove around the western part of the country to look for a place, where I can escape. I noticed that not only cities are full of these cell towers and base stations, but outside of the them they are springing up. To my biggest surprise I saw many towers at the top of hills surrounding the highways, all over the states that I visited. Unless I am willing to settle down in the middle of the desert in Nevada or perhaps in a totally uninhibited area of Montana, during my weeks of search I found no place free of cell towers.

As a result of not being around my business suffered a lot, customers left. I could not even tell them why I was not around, they would have thought that I lost my marbles. Even very close friends I told my case to thought that I had gone crazy.

Why I put this on the web? I think there are people out there who could have had a similar experience to mine, who are running around scared looking for solutions and thinking if millions are not feeling similar pain, there maybe something wrong with them. Their lives could have been turned upside down too. They need a job to survive, so are stuck in cities and live with constant pain. Some others maybe willing or able to move away, but where? What opportunity they would have to start life over? What about people with a family, who cannot drag them around in good conscience? Even if it looks like one found a place, they can't be sure the phone companies are not catching up with them.

The phone companies are transmitting at higher and higher frequencies. Thus it seems that sensitive people would feel the effect from farther away distance than before. Research is funded by the telecommunication industry. This is a big business. I don't think I or any of us can fight it. I can see, cell phone is the future, it is convenient and has advantages with its portability over the wired phone.

What I hope for is, that research can be funded independent of phone companies. If I recall my memories correctly, a few years ago in the state where I live, people tried to navigate a lost humpback whale back from the river to the sea -unsuccessfully- this endeavor cost the taxpayers a few million dollars. I hope, that in this country the lives of effected people - maybe hundreds of us, worth at least that much.

If you had a similar experience, E-mail me. Once we know there are many of us, perhaps we can ask our government to assign a small place -or several of them- where no cell towers/base stations would be put up. Perhaps the millions of people who are not sensitive to this would forgive us for the inconvenience of not being able to talk on the phone while driving through these areas. I don't care whether the FCC admits or not that exposure to radiation from cell phones and towers causes cancer or not. I do not want to sue the phone companies for causing me pain or loss of income. I do not think other human beings deliberately cause pain to a few of us by advancing technology for better life style. All I want to do is to live a normal life.

Write me (E-mail: microhazard@razban.com). The solution to solve our problem is easy. We simply have to show that enough of us are affected.

and

EMF Hypersensitivity - Tower Trauma In Canada

By Robert Riedlinger

My wife and I thought we had the world in our hands when we bought a home in a resort area east of Vancouver B.C., Canada in the fall of 1995. We both enjoyed good health and planned to retire in our new home by a lovely lake and a nice quite village, but our world came crashing down soon after moving in. First we heard a buzzing sound like bees in a distance and we started to feel strange symptoms one after the other the longer we stayed there. We would wake at the

same time every morning with the buzz and within a short while I would feel a pressure in my ears and my head would ache. My wife and I both woke with pain in our necks and shoulders and all day we would have continous nausea and stomach gas.The longer we stayed the more symptoms appeared and the more we suffered.

My ears would block and any normal sound, like breraking glass, would hurt them. Even flushing the water closet would hurt my ears. It got so I could not use the phone and I would have to ask people to repeat themselves when talking to me. My wife became ill with pain in her lower part of her stomach and two different doctors diagnosed gall bladder problems. Her shoulder became so painfull she could not raise her arm to do her hair. I made a pad from aluminum foil and placed it on her shoulder and that helped. I sat many hours under a cone of aluminum insullation to rest my nerves and I place a solar blanket made of plastic clad with aluminum over my blanket and that seems to reflect a lot of rays.

We became so ill that we had to move from our home after a year and I am now hypersensitive to microwaves. I had to sleep in a metal box for months untill I regained some health. After my wife spent a few months in Brazil she came back feeling better.

I would advise any one that lives near a tower and starts to feel the following symptoms to get out fast before you become sensitive as I have. The symptoms started with a buzzing sound and developed into a high pitch sizzle sound in my head , pressure headaches, blocked ears, pains in neck shoulder and other joints, nausea, excessive stomach gas, stress, burning eyes, memory loss and fatigue.

Our Health Ministry won't help us. They accept test results that were take by the Cellphone Company which were taken at the base of the tower, where there is lower density, and inside of a vehicle that would shield the rays. A proper test instrument which is a spectrum analizer cost about thirty grand so the average person can't afford it. Don't you think that it would be only fair if they intend to keep us in a microwave oven that they supply us with a rotating bed so that we cook evenly on all sides. I intend to do all I can in the future to see that no one else ever gets burn't as I did. I often think of babies and older people that are helpless and can't move as we did. I would like to hear from any one that has had a similar experience.

http://www.feb.se/Bridlewood/PERSONAL.HTM

BMA calls for precautionary ban on

In an important development that may have implications for justifying the use of the precautionary principle in other issues, such as with mobile phone use, the British medical Association has called for the banning of GM farm crop trials, to quote from the below article:

"There has not yet been a robust and thorough search into the potentially harmful effects of GM foodstuffs on human health. On the basis of the precautionary principle, farm-scale trials should not be allowed to continue."

It could also be argued that since there has not yet been a" robust and thorough search into the potentially harmful effects" of extended mobile phone use on human health perhaps a precautionary principle move is also warranted. Such a move could be following the recommendations of the U.K. Sir William Stewart inquiry, "In line with our precautionary approach, we believe that the widespread use of mobile phones by children for non-essential calls should be discouraged".

Perhaps the BMA should consider applying their reasoning to the issue of children and mobile phone use.

Don Maisch

Electromagnetic Radiation Health Effects in Exposed and Non-Exposed Residents in Penang

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Author(s) Leave a comment

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Abstract

A comparative study was conducted between residents exposed and not exposed to electromagnetic radiation (EMR) from TELCO towers in Penang Island with the objective of determining the possible health effects using 14 non-specific health symptoms (NSHS). Interviews on 201 respondents were conducted using structured questionnaire for demographic details, health related problems and the public concern. Comparison of symptoms frequencies and its significance (Chi-square test) between the exposed and not exposed residents from the TELCO tower showed statistical significance ($p < 0.05$) for headache, giddiness, insomnia, loss of memory, diarrhea, mental slowness, reduced reaction time and mood swing. The odds ratio for the development of the NSHS scored > 1 for all that gave a conclusion that respondents who were exposed were more likely to suffer symptoms as compared to the respondents who were not exposed to EMR. This outcome showed that the existence of TELCO tower in these communities has detrimental health effects towards the residents who were exposed to the electromagnetic fields radiation that was emitted. Measures to be taken to minimize adverse health effects on residents should include imposing more stringent guidelines in terms of safety distance and radiation intensity, practicing of WHO precautionary approach, encouraging electromagnetic fields radiation related conference, researches and public awareness, sharing of transceivers by TELCO companies and using protective barriers. These steps will ultimately promote a healthier, harmonious and sustainable living environment.

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DNA and Chromosomal Damage in Residents Near a Mobile Phone Base Station

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KEYWORDS Buccal Micronucleus Cytome Assay. DNA Damage. Micronuclei. Single Cell Gel Electrophoresis Assay

ABSTRACT Mobile phone base stations, continuously emit low-frequency radiofrequency (RF) radiations and thus are a cause of public health concern. In the present study, genetic damage in peripheral blood leukocytes (single cell gel electrophoresis/ comet assay) and buccal mucosal cells (buccal micronucleus cytome assay) of individuals residing in the vicinity of a mobile phone tower (n=50, power density 11.18±0.13 W/m^2), and in healthy controls from areas with no nearby towers (n=25, power density, 0.04±0.00 W/m^2), was assessed. Damage frequency, damage index, mean DNA migration length, frequencies of micronucleated, basal and pyknotic cells were significantly elevated (p=0.000) in the sample group. Age, diet, location of residences, distance from mobile phone base station and phone-set Specific Absorbance Rate values were significant predictors of genetic damage. Hence the observations indicate that 24x7 continuous exposure from base stations may pose genetic-damage threat to the populace residing nearby.

INTRODUCTION

The upsurge in the Indian mobile phone subscriber base reaching ~891 million (Dot 2013) has been concurrent with installation of mobile phone base station, there being 540,000 (Dot 2012). In the city of Amritsar there has been gross violations of installation norms and a rise in associated non-specific health symptoms in those residing near the base stations (Gandhi et al. 2013; Gandhi et al. 2014). Rather the increasing utility of radiofrequency radiation (RFR)-emitting consumer devices has for quite sometime drawn the attention of the public to possible health effects from RFR (10 KHz -300 GHz)- exposure (Maes et al. 2006). Epidemiological studies have suggested associations with symptoms such as headache, fatigue, and difficulty in concentration among people living in vicinity of mobile towers with higher potential exposures to radiation (Santini et al. 2002; Santini et al. 2003; Abdel-Rassoul et al. 2007; Gandhi et al. 2014; Suleiman et al. 2014). Documented biological effects have included EEG changes and calcium-ion efflux from extremely low frequency (ELF) electromagnetic fields (3Hz – 3KHz) and from radiofrequency (10 KHz -300 GHz) radiations (Lai 2001). Reports on genetic effects of ELF – EMF and RFR also exist (Phillips et al. 2009; Lai 2012;Singh and Kapoor 2014). Besides increase in DNA strand breaks (Diem et al. 2005; Franzellitti et al. 2010; Mihai et al. 2014), DNA – protein and DNA – DNA cross links (Blank and Goodman 2009) and chromosomal damage (Maes et al. 2006; Winker et al. 2005), neurological effects have also been observed associated with cases of dysaesthesia (Hocking and Westerman 2003). Genetic defects that predispose to the development of cancer particularly lymphomas and leukemias as well as birth defects such as Down's syndrome have also been reported (Carpenter 2010),though some studies have not demonstrated any link between increased cancer risk and RF exposure (INTERPHONE study group 2010; Frei et al. 2011). In fact rather the ability of radio frequency radiations in the microwave range to induce mutagenesis, chromosomal aberrations and carcinogenesis in different *in vivo* and *in vitro* systems has been equivocally reported (Hansteen et al. 2009; Ruediger 2009).

The growth in installation of mobile phone base stations has been very rapid in order to cater to the demands of increasing use of mobile telecommunication technology. The presence of base stations in densely-populated areas emitting RFR 24x7 may impact and compromise the

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health of those in the vicinity. A number of studies on adverse health effects as non-specific health symptoms in those staying near mobile phone base stations exists (Santini et al. 2002; Gadzicka et al. 2006; Abdel-Rassoul et al. 2007; Gandhi et al. 2014; Suleiman et al. 2014), yet studies on genetic damage assessment have not yet come to attention.

'Cellphone towers' electromagnetic radiation harmful'

B K Mishra, TNN | May 6, 2015, 02.33AM IST

PATNA: With a phenomenal increase in the number of cellphone users in Bihar over the years, varieties of mobile phones have flooded the city markets. Patnaites, however, are least bothered about the harmful effects of electromagnetic radiation emitted from cellphone towers.

Birds are the worst victims of radiation, according to environmentalists. The population of house sparrows has dwindled considerably in recent years due to the rising number of cellphone towers in different parts of the city.

Patna Science College environmental science department teacher Shardendu says, "Mobile phones and towers emit a very low frequency of 900 or 1,800MHz, called microwaves. These waves can damage bird eggs and embryos as they cause thin skulls of chicks and thin eggshells" Besides, birds are known to be sensitive to magnetic radiation. Microwaves can interfere with their sensors and misguide them while navigating and preying, Shardendu adds.

Environmentalist Mehta Nagendra Singh says mobile phone towers crowding the city skyline are making the air toxic. There are indicative studies to prove that these radiations are harmful for people living in a 300-metre radius of a cellphone tower. Pregnant women and children are at a higher risk than the normal population. The younger the child, the deeper is the penetration of electromagnetic radiation due to the fact that children's skulls are thinner.

Radiation from such towers poses grave health risks including memory loss, lack of concentration and digestive disturbances, he says.

It is very unfortunate to see huge cellphone towers thronging the rooftops in and around residential apartments, hospitals, schools and educational institutions and this has become more or less a common sight in cities across the state and elsewhere. The radiation has already led to the disappearance of several species of butterflies, bees, insects and sparrows, Singh claims.

Head of Patna Science College physics department Anil Verma says the popularity of cellphones and wireless communication devices has resulted in the proliferation of cellphone towers across the city. "While all of us have had our share of fun with mobile technology, it is now time to introspect and study the problems that one could face because of cellphone towers being installed in residential areas," he adds.

Even though the state government last year had ordered removal of 784 communication towers of different mobile companies located within 100 metre radius of residential, hospital and school areas in the state capital, not a single one has been removed till date, says Mahesh Chandra, a resident of Rajendra Nagar. As the telecommunication companies or service providers pay handsome amount as rent for installation of these towers, letting out building for cellphone towers is a good source of income for property owners and institutions, adds Chandra.

Cell Phone Radiation Alters Brain Activity Studies Show

But it's Not Clear Whether That Causes any Harm, Scientists Say

MSNBC News

Julie Steenhuysen

Reuters

2/22/2011

CHICAGO — Spending 50 minutes with a cell phone plastered to your ear is enough to change brain cell activity in the part of the brain closest to the antenna.

But whether that causes any harm is not clear, scientists at the National Institutes of Health said on Tuesday, adding that the study will likely not settle recurring concerns of a link between cell phones and brain cancer.

"What we showed is glucose metabolism (a sign of brain activity) increases in the brain in people who were exposed to a cell phone in the area closet to the antenna," said Dr. Nora Volkow of the NIH, whose study was published in the Journal of the American Medical Association.

The study was meant to examine how the brain reacts to electromagnetic fields caused by wireless phone signals.

Volkow said she was surprised that the weak electromagnetic radiation from cell phones could affect brain activity, but she said the findings do not shed any light on whether cell phones cause cancer.

"This study does not in any way indicate that. What the study does is to show the human brain is sensitive to electromagnetic radiation from cell phone exposures."

Use of the devices has increased dramatically since they were introduced in the early-to-mid 1980s, with about 5 billion mobile phones now in use worldwide.

Some studies have linked cell phone exposure to an increased risk of brain cancers, but a large study by the World Health Organization was inconclusive.

Volkow's team studied 47 people who had brain scans while a cell phone was turned on for 50 minutes and another while the phone was turned off.

While there was no overall change in brain metabolism, they found a 7 percent increase in brain metabolism in the region closest to the cell phone antenna when the phone was on.

Experts said the results were intriguing, but urged that they be interpreted with caution.

"Although the biological significance, if any, of increased glucose metabolism from acute cell phone exposure is unknown, the results warrant further investigation," Henry Lai of the University of Washington, Seattle, and Dr. Lennart Hardell of University Hospital in Orebro, Sweden, wrote in a commentary in JAMA.

"Much has to be done to further investigate and understand these effects," they wrote.

Professor Patrick Haggard of University College London said the results were interesting since the study suggests a direct effect of cell phone signals on brain function.

But he said much larger fluctuations in brain metabolic rate can occur naturally, such as when a person is thinking.

"If further studies confirm that mobile phone signals do have direct effects on brain metabolism, then it will be important to investigate whether such effects have implications for health," he said.

Volkow said the findings suggest the need for more study to see if cell phones have a negative effect on brain cells.

Meanwhile, Volkow isn't taking any chances. She now uses an ear phone instead of placing a cell phone next to her ear.

"I don't say there is any risk, but in case there is, why not?"

TRIB local Wilmette/Kenilworth

Cell phone tower voted down at Wilmette park

By **John P. Huston** TribLocal reporter
Feb. 15 at 12:15 p.m.

Wilmette residents organized and spoke Feb. 14 in opposition of a proposed cell phone tower at Centennial Recreation Complex at a park district meeting.

Though not all Wilmette Park District commissioners agreed it was a health hazard, a community protest spurred the board voted to nix a vendor's request to install cell phone antennae above its ice rink.

A resident reads a comment Feb. 14 to a Wilmette Park District committee in opposition of a proposed cell phone tower above Centennial Recreation Complex. (John P. Huston, Tribune reporter)

More than 100 people filled the Council Chambers at Village Hall on Monday evening, many wearing buttons and holding signs that said, "Centennial — Cell Antenna Free Zone."

Park Commissioner James Crowley thanked the group for politely stating their case during public comment and refraining from any aggressive finger-pointing.

"We're all neighbors. We're all part of the community," Crowley said.

More than 550 residents signed a petition opposing the AT&T request, through local contractor Callahan Communications Services Inc., to erect a 9-foot cell antennae apparatus atop the ice rink at Centennial Recreation Complex, 2300 Old Glenview Road.

Many cited health concerns for the children and adults who use the facility. Others questioned the equipment's aesthetics and said it could negatively impact area property values.

Commissioners voted 6-1 to reject Callahan's application.

Only Commissioner Mike Murdock voted against the motion to reject the proposed lease, which would have created $36,000 per year in new revenue.

Several residents scoffed at creating a potential health risk at the park for $3,000 a month, which "doesn't sound like a lot of money, and I would agree with that," Murdock said. But he added that the village rents space to several cellular providers and generates about $300,000 per year.

"It translates into millions and millions of dollars over the life of these contracts. That is not insignificant," Murdock said.

Board President Dennis O'Malley and Commissioner Jim Brault said they were unconvinced by community members' arguments that a potential health risk could be posed by a cell tower. However, both voted to halt the plan.

"I've been unpersuaded by the health argument. I'm not convinced this is a good or a bad thing," Brault said.

He said he was persuaded by the nature of the neighborhood's outcry over the issue.

"Part of our role in the park district is to keep our community happy," Brault said.

One of the community organizers, Ellen Kaufman, who lives near Centennial, was extremely happy after Monday's vote to end the cell tower plan.

"The community has spoken and I'm thrilled the park district heard us," Kaufman said.

The issue resulted in a public outcry last month after the park district approved — with little fanfare — a previous request from Callahan and forwarded it to the village's Zoning Board of Appeals to apply for a special use permit.

When residents learned of the proposal, they quickly assembled and persuaded park district officials to ask Callahan to remove its application from the village's agenda pending further review.

Originally, Park District Executive Director Steve Wilson said it would only ask Callahan to make aesthetic changes to its application, but that federal regulations on cellular antennae meant they were safe.

Residents said that wasn't good enough, saying scientific studies are inconclusive on the subject of safety — and that element of doubt is enough to take a "better safe than sorry" attitude.

Art Lutschaunig, a Wilmette resident as well as youth hockey and soccer coach, said it's the park district's policy to stop games or practices if there's lightning or thunder in the area.

"That's a 1-in-750,000 chance of getting struck by lightning," Lutschaunig said. "Why we're not using that same thought process when we're talking about putting in a cell phone tower — it doesn't add up for me."

Wilmette resident Philip Schmidt, who also lives near the Centennial Recreation Complex, offered a suggestion to park commissioners to recoup the $36,000 it expected to generate from leasing space for the cell antennae — increase user fees.

“A dollar here, or a dollar there,” Schmidt said. “It won’t kill us. We’re Wilmette. We can handle it.”

LE Magazine August 2007

REPORT

The Hidden Dangers of Cell Phone Radiation

By Sue Kovach

Every day, we're swimming in a sea of electromagnetic radiation (EMR) produced by electrical appliances, power lines, wiring in buildings, and a slew of other technologies that are part of modern life. From the dishwasher and microwave oven in the kitchen and the clock radio next to your bed, to the cellular phone you hold to your ear—sometimes for hours each day—exposure to EMR is growing and becoming a serious health threat.

But there's a huge public health crisis looming from one particular threat: EMR from cellular phones—both the radiation from the handsets and from the tower-based antennas carrying the signals—which studies have linked to development of brain tumors, genetic damage, and other exposure-related conditions.[1-9] Yet the government and a well-funded cell phone industry media machine continue to mislead the unwary public about the dangers of a product used by billions of people. Most recently, a Danish epidemiological study announced to great fanfare the inaccurate conclusion that cell phone use is completely safe.[10]

George Carlo, PhD, JD, is an epidemiologist and medical scientist who, from 1993 to 1999, headed the first telecommunications industry-backed studies into the dangers of cell phone use. That program remains the largest in the history of the issue. But he ran afoul of the very industry that hired him when his work revealed preventable health hazards associated with cell phone use.

In this article, we look at why cell phones are dangerous; Dr. Carlo's years-long battle to bring the truth about cell phone dangers to the public; the industry's campaign to discredit him and other scientists in the field; and what you can do to protect yourself now.

CELL PHONES REACH THE MARKET WITHOUT SAFETY TESTING

The cellular phone industry was born in the early 1980s, when communications technology that had been developed for the Department of Defense was put into commerce by companies focusing on profits. This group, with big ideas but limited resources, pressured government regulatory agencies—particularly the Food and Drug Administration (FDA)—to allow cell phones to be sold without pre-market testing. The rationale, known as the "low power exclusion," distinguished cell phones from dangerous microwave ovens based on the amount of power used to push the microwaves. At that time, the only health effect seen from microwaves involved high power strong enough to heat human tissue. The pressure worked, and cell phones were exempted from any type of regulatory oversight, an exemption that continues today. An eager public grabbed up the cell phones, but according to Dr. George Carlo, "Those phones were slowly prompting a host of health problems."

Today there are more than two billion cell phone users being exposed every day to the dangers of electromagnetic radiation (EMR)—dangers government regulators and the cell phone industry refuse to admit exist. Included are: genetic damage, brain dysfunction, brain tumors, and other conditions such as sleep disorders and headaches.[1-9] The amount of time spent on the phone is irrelevant, according to Dr. Carlo, as the danger mechanism is triggered within seconds. Researchers say if there is a safe level of exposure to EMR, it's so low that we can't detect it.

The cell phone industry is fully aware of the dangers. In fact, enough scientific evidence exists that some companies' service contracts prohibit suing the cell phone manufacturer or service provider, or joining a class action lawsuit. Still, the public is largely ignorant of the dangers, while the media regularly trumpets new studies showing cell phones are completely safe to use. Yet, Dr. Carlo points out, "None of those studies can prove safety, no matter how well they're conducted or who's conducting them." What's going on here? While the answer in itself is simplistic, how we got to this point is complex.

FLAWED DANISH STUDY REPORTS CELL PHONES ARE SAFE

In December, 2006, an epidemiological study on cell phone dangers published in the Journal of the National Cancer Institute

sent the media into a frenzy.[10] Newspaper headlines blared: "Danish Study Shows Cell Phone Use is Safe," while TV newscasters proclaimed, "Go ahead and talk all you want—it's safe!" The news seemed to be a holiday gift for cell phone users. But unfortunately, it's a flawed study, funded by the cell phone industry and designed to bring a positive result. The industry's public relations machine is working in overdrive to assure that the study get top-billing in the media worldwide.

According to Dr. George Carlo, the study, by its design, could not identify even a very large risk. Therefore, any claim that it proves there's no risk from cell phones is a blatant misrepresentation of the data that will give consumers a very dangerous false sense of security.

"Epidemiological studies are targets for fixing the outcome because they're observational in nature instead of experimental," Dr. Carlo explains. "It's possible to design studies with pre-determined outcomesthat still fall within the range of acceptable science. Thus, even highly flawed epidemiological studies can be published in peer-reviewed journals because they're judged against a pragmatic set of standards that assume the highest integrity among the investigators."

Key problems with the study are:

1. There are few discernable differences between who was defined as cell phone users and who wasn't. Thus, people defined as exposed to radiation were pretty much the same as those defined as not exposed to radiation. With few differences, it's nearly impossible to find a risk.

2. Users were defined as anyone who made at least one phone call per week for six months between 1982 and 1995. So any person who made 26 calls was a cell phone user and therefore considered exposed to radiation. Those with less than 26 calls were non-users. In reality, the radiation exposure between users and non-users defined in this manner is not discernable.

3. The "exposed" people used ancient cell phone technology bearing little resemblance to cell phones used today. The results, even if reliable, have no relevance to the 2 billion cell phone users today.

4. From 1982 to 1995, cell phone minutes cost much more than today and people used their phones much less. Thus there was very little radiation exposure.

5. During the study's time frame, people likely to use their cell phones the most were commercial subscribers. Yet this highest exposed group, in whom risk would most easily be identified, was specifically excluded from the study.

6. There were no biological hypotheses tested in the study. It was therefore only a numbers game. Ignored were mechanisms of disease found in other studies of cell phone radiation effects, including genetic damage, blood-brain barrier leakage, and disrupted intercellular communication. The study did not discuss any research supporting the notion that cell phones could cause problems in users.

7. The study itself was inconsistent with cancer statistics published worldwide addressing the Danish population. This study showed a low risk of cancer overall, when in fact Denmark has some of the highest cancer rates in the world. This inconsistency suggested that something in the data does not add up.

The cell phone industry constantly guards its financial interests, but unfortunately, an unwitting public can be harmed in the process, says Dr. Carlo. "Industry-funded studies in many cases now produce industry-desired outcomes. By tampering with the integrity of scientists, scientific systems and public information steps over the lines of propriety that are appropriate for protecting business interests—especially when the casualty of the interference is public health and safety."

To learn more about the dangers of cell phones and to read Dr. George Carlo's full formal analysis of the Danish cell phone study, visit the Safe Wireless Initiative website at www.safewireless.org.

LAWSUIT PROMPTS SAFETY STUDIES

In 1993, the cell phone industry was pressured by Congress to invest $28 million into studying cell phone safety. The cause of this sudden concern was massive publicity about a lawsuit filed by Florida businessman David Reynard against cell phone manufacturer NEC. Reynard's wife, Susan, died of a brain tumor, and he blamed cell phones for her death. Reynard revealed the suit to the public on the Larry King Live show, complete with dramatic x-rays showing the tumor close to where Susan held her cell phone to her head for hours each day.

The next day, telecommunications stocks took a big hit on Wall Street and the media had a field day. The industry trade

association at the time, the Telecommunications Industry Association (TIA), went into crisis mode, claiming thousands of studies proved cell phones were safe and what Reynard and his attorney said was bunk. TIA reassured the public that the government had approved cell phones, so that meant they were safe. The media demanded to see the studies, but, says Dr. Carlo, "the industry had lied. The only studies in existence then were on microwave ovens. At that time, 15 million people were using cell phones, a product that had never been tested for safety."

DR. CARLO HEADS CELL PHONE RESEARCH

CELL PHONE RADIATION: WHAT YOU NEED TO KNOW

- Originally developed for the Department of Defense, cell phones devices were never tested for safety. They entered the marketplace due to a regulatory loophole.
- Questions about cell phone safety arose in the early 1990s, when a businessman filed a lawsuit alleging that cell phones caused his wife's death due to brain cancer.
- To address the questions surrounding cell phone safety, the cell phone industry set up a non-profit organization, Wireless Technology Research (WTR). Dr. George Carlo was appointed to head WTR's research efforts.
- Under Dr. Carlo's direction, scientists found that cell phone radiation caused DNA damage, impaired DNA repair, and interfered with cardiac pacemakers.
- European research confirmed Dr. Carlo's findings. Studies suggest that cell phone radiation contributes to brain dysfunction, tumors, and potentially to conditions such as autism, attention deficit disorder, neurodegenerative disease, and behavioral and psychological problems.
- Dr. Carlo brought safety information about cell phones to the public through his book, Cell Phones: Invisible Hazards in the Wireless Age, and by creating the Safe Wireless Initiative and the Mobile Telephone Health Concerns Registry.
- The best protection against cell phone radiation is keeping a safe distance.
- Always use a headset to minimize exposure to harmful cell phone radiation.

Forced to take action, the cell phone industry set up a non-profit organization, Wireless Technology Research (WTR), to perform the study. Dr. Carlo developed the program outline and was asked to head the research. Oversight of the issue was charged to the FDA, though it could have and probably should have gone to the Environmental Protection Agency (EPA), which fought hard for jurisdiction. But the industry had enough influence in Washington to get whatever overseer it wanted. It simply didn't want to tangle with EPA because, says Dr. Carlo, " ..the EPA is tough."

"Anything that's ever made a difference in terms of public health has come from the EPA," he says. "But safety issues that are covered in corruption and questions seem to always have a connection to the FDA, which has been manipulated by pharmaceutical companies since it was born."

When called to help with the cell phone issue, Dr. Carlo was working with the FDA on silicone breast implant research. The choice of Dr. Carlo to head WTR seemed unusual to industry observers. An epidemiologist whose expertise was in public health and how epidemic diseases affect the population, he appeared to lack any experience in researching the effects of EMR on human biology. Based on this, a premature conclusion was drawn by many: Dr. Carlo was an "expert" handpicked by the cell phone industry, and therefore his conclusions would only back up the industry's claim that cell phones are safe.

Dr. Carlo, however, refused to be an easy target. He quickly recruited a group of prominent scientists to work with him, bulletproof experts owning long lists of credentials and reputations that would negate any perception that the research was predestined to be a sham. He also created a Peer Review Board chaired by Harvard University School of Public Health's Dr. John Graham, something that made FDA officials more comfortable since, at the time, the agency was making negative headlines due to the breast implant controversy. In total, more than 200 doctors and scientists were involved in the project.

STRICT STUDY GUIDELINES

Once all involved agreed on what was to be done, Dr. Carlo presented the study's stakeholders in the industry, the government, and the public with a strict list of criteria for moving forward.

"The money had to be independent of the industry—they had to put the money in trust and couldn't control who got the funds," he says. "Second, everything had to be peer reviewed before it went public, so if we did find problems after peer review, we could use that information publicly to recommend interventions."

A third requirement was for the FDA to create a formal interagency working group to oversee the work and provide input. The purpose of this was to alleviate any perception that the industry was paying for a result, not for the research itself. But the fourth and last requirement was considered by Dr. Carlo to be highly critical: "Everything needed to be done in sunlight. The media had to have access to everything we did."

THE RESEARCH BEGINS

The program began, but Dr. Carlo soon discovered that everyone involved had underlying motives."The industry wanted an insurance policy and to have the government come out and say everything was fine. The FDA, which looked bad because it didn't require pre-market testing, could be seen as taking steps to remedy that. By ordering the study, law makers appeared to be doing something. Everyone had a chance to wear a white hat."

Dr. Carlo and his team developed new exposure systems that could mimic head-only exposure to EMR in people, as those were the only systems that could approximate what really happened with cell phone exposure. Those exposure systems were then used for both in vitro (laboratory) and in vivo (animal) studies. The in vitro studies used human blood and lymph tissue in test tubes and petri dishes that were exposed to EMR. These studies identified the micronuclei in human blood, for example, associated with cell phone near-field radiation. The in vivo studies used head only exposure systems and laboratory rats. These studies identified DNA damage and other genetic markers.

Says Dr. Carlo: "We also conducted four different epidemiological studies on groups of people who used cell phones, and we did clinical intervention studies. For example, studies of people with implanted cardiac pacemakers were instrumental in our making recommendations to prevent interference between cell phones and pacemakers. In all, we conducted more than fifty studies that were peer-reviewed and published in a number of medical and scientific journals."

INDUSTRY SEEKS TO DISCREDIT FINDINGS, SCIENTISTS

But manipulation by the industry had begun almost immediately at the start of research. While Dr. Carlo and his team had never defined their research as being done to prove the safety of cell phones, the industry internally defined it as an insurance policy to prove that phones were safe. From the outset, what was being said by the cell phone industry in public was different from what was being said by the scientists behind closed doors.

The pacemaker studies were a harbinger of bad things to come. Results showed that cell phones do indeed interfere with pacemakers, but moving the phone away from the pacemaker would correct the problem. Amazingly, the industry was extremely upset with the report, complaining that the researchers went off target. When Dr. Carlo and his colleagues published their findings in the New England Journal of Medicine in 1997,[11] the industry promptly cut off funding for the overall program. It took nine months for the FDA and the industry to agree on a scaled-down version of the program to continue going forward. Dr. Carlo had volunteered to step down, since he was clearly not seeing eye-to-eye with the industry, but his contract was extended instead, as no one wanted to look bad from a public relations standpoint.

The research continued, and what it uncovered would be a dire warning to cell phone users and the industry's worst nightmare. When the findings were ready for release in 1998, the scientists were suddenly confronted with another challenge: the industry wanted to take over public dissemination of the information, and it tried everything it could to do so. It was faced with disaster and had a lot to lose.

Fearing the industry would selectively release research results at best, or hold them back at worst, Dr. Carlo and his colleagues took the information public on their own, creating a highly visible war between the scientists and the industry. An ABC News expose on the subject increased the wrath of the industry.

According to Dr. Carlo, "The industry played dirty. It actually hired people to put negative things about me and the other scientists who found problems on the internet, while it tried to distance itself from the program. Auditors were brought in to say we misspent money, but none of that ever held up. They tried every angle possible."

This included discussions with Dr. Carlo's ex-wife to try to figure out ways to put pressure on him, he says. Threats to his career came from all directions, and Dr. Carlo learned from Congressional insiders that the word around Washington was that he was

"unstable." But all the character assassination paled in comparison to what happened next.

Toward the end of 1998, Dr. Carlo's house mysteriously burned down. Public records show that authorities determined the cause of the blaze was arson, but the case was never solved. Dr. Carlo refuses to discuss the incident and will only confirm that it happened. By this time, enough was enough. Dr. Carlo soon went "underground," shunning the public eye and purposely making himself difficult to find.

WHY CELL PHONES ARE DANGEROUS

A cellular phone is basically a radio that sends signals on waves to a base station. The carrier signal generates two types of radiation fields: a near-field plume and a far-field plume. Living organisms, too, generate electromagnetic fields at the cellular, tissue, organ, and organism level; this is called the biofield. Both the near-field and far-field plumes from cell phones and in the environment can wreak havoc with the human biofield, and when the biofield is compromised in any way, says Dr. Carlo, so is metabolism and physiology.

"The near field plume is the one we're most concerned with. This plume that's generated within five or six inches of the center of a cell phone's antenna is determined by the amount of power necessary to carry the signal to the base station," he explains. "The more power there is, the farther the plume radiates the dangerous information-carrying radio waves."

A carrier wave oscillates at 1900 megahertz (MHz) in most phones, which is mostly invisible to our biological tissue and doesn't do damage. The information-carrying secondary wave necessary to interpret voice or data is the problem, says Dr. Carlo. That wave cycles in a hertz (Hz) range familiar to the body. Your heart, for example, beats at two cycles per second, or two Hz. Our bodies recognize the information-carrying wave as an "invader," setting in place protective biochemical reactions that alter physiology and cause biological problems that include intracellular free-radical buildup, leakage in the blood-brain barrier, genetic damage, disruption of intercellular communication, and an increase in the risk of tumors. The health dangers of recognizing the signal, therefore, aren't from direct damage, but rather are due to the biochemical responses in the cell.

Here's what happens:

- Cellular energy is now used for protection rather than metabolism. Cell membranes harden, keeping nutrients out and waste products in.
- Waste accumulating inside the cells creates a higher concentration of free radicals, leading to both disruption of DNA repair (micronuclei) and cellular dysfunction.
- Unwanted cell death occurs, releasing the micronuclei from the disrupted DNA repair into the fluid between cells (interstitial fluid), where they are free to replicate and proliferate. This, says Dr. Carlo, is the most likely mechanism that contributes to cancer.
- Damage occurs to proteins on the cell membrane, resulting in disruption of intercellular communication. When cells can't communicate with each other, the result is impaired tissue, organ, and organism function. In the blood-brain barrier, for example, cells can't keep dangerous chemicals from reaching the brain tissue, which results in damage.

With the background levels of information-carrying radio waves dramatically increasing because of the widespread use of cell phones,Wi-Fi, and other wireless communication, the effects from the near and far-fields are very similar. Overall, says Dr. Carlo, almost all of the acute and chronic symptoms seen in electrosensitive patients can be explained in some part by disrupted intercellular communication. These symptoms of electrosensitivity include inability to sleep, general malaise, and headaches. Could this explain the increase in recent years of conditions such as attention-deficit hyperactivity disorder (ADHD), autism, and anxiety disorder?

"One thing all these conditions have in common is a disruption, to varying degrees, of intercellular communication. When we were growing up, TV antennas were on top of our houses and such waves were up in the sky. Cell phones and Wi-Fi have brought those things down to the street, integrated them into the environment, and that's absolutely new. The recognition mechanism, where protein vibration sensors on the cell membrane pick up a signal and interpret it as an invader, only works because the body recognizes something it's never seen before."

As to increases in brain tumors tied to cell phone use, it's too early to tell due to a lack of hard data, says Dr. Carlo. "We're never going to see that in time to have it matter. Here in the US, we're six years behind in getting the brain tumor database completed, and currently the best data are from 1999. By the time you see any data showing an increase, the ticking time bomb is set."

Epidemic curve projections, however, indicate that in 2006, we can expect to see 40,000 to 50,000 cases of brain and eye cancer. This is based on published peer-reviewed studies that allow calculation of risk and construction of epidemic curves. By 2010, says Dr. Carlo, expect that number to be between 400,000 and 500,000 new cases worldwide.

"This means we're on the beginning curve of an epidemic, with epidemic defined as a change in the occurrence of a disease that is so dramatic in its increase that it portends serious public health consequences," says Dr. Carlo. "This is what's not being told to the public. One of the things that I suggest to people who use a cell phone is to use an air tube headset. If you use a wired headset, the current moving through the wire of the headset attracts ambient informational carrying radio waves and thereby increases your exposure."

GAUSS METERS: DETECTING ELECTROMAGNETIC RADIATION

Invisible electromagnetic radiation surrounds us each day, emanating from diverse sources such as power lines, home wiring, computers, televisions, microwave ovens, photocopy machines, and cell phones.

While undetectable to the eye, scientists have proposed that electromagnetic radiation may pose serious health effects, ranging from childhood leukemia to brain tumors.

As scientists continue to unravel the precise health dangers of electromagnetic radiation, it makes good sense to avoid these potentially dangerous frequencies as much as possible. A gauss meter is a useful tool you can use to measure electromagnetic radiation in your home and work environments.

Using the gauss meter at varied locations, you can easily detect electromagnetic radiation "hot spots" where exposure to these ominous frequencies is the greatest. Armed with this crucial information, you can then avoid these areas, re-arranging furniture or electronic devices as needed in order to avoid unnecessary exposure to electromagnetic radiation.

REPORT

The Hidden Dangers of Cell Phone Radiation

By Sue Kovach

DR. CARLO'S CONTINUING WORK

Following the loss of his home, Dr. Carlo collaborated with Washington columnist Martin Schram—who in the course of the work did his own research to corroborate Dr. Carlo's view on things—to write Cell Phones: Invisible Hazards in the Wireless Age (Carroll & Graf, 2001). He wrote his book as what he thought would be a last volley at the cell phone industry.

"I needed to tell the whole story in one place. I didn't have the resources or the manpower to match what the cell phone industry was doing to try to discredit the work," says Dr. Carlo. "Based on the book, a number of lawsuits were brought against the industry, and insurance carriers began excluding cell phone-related health risks in their coverage. It created a very difficult situation in the industry and for myself. I was worn out fighting that battle. In 2002, after I'd done my book tour, I just decided to take a break for a couple of years."

Instead of taking a break, however, Dr. Carlo ended up working behind the scenes, setting up an organization and a registry for the benefit of consumers. It was a creative solution as part of the settlement of a lawsuit brought by a Illinois citizen against the cell phone industry, WTR, and Dr. Carlo personally. The lawsuit alleged that the cell phone industry, WTR, and Dr. Carlo were conspiring to hide the dangers of cell phones. Dr. Carlo was offered a way out of the suit because his book had made it clear he wasn't on the same page as the industry.

"I wanted to make sure the litigation brought at least some value to consumers. We created the Safe Wireless Initiative (www.safewireless.org) for disseminating information on the dangers and on prevention, and the Mobile Telephone Health Concerns Registry (www.health-concerns.org) to track information voluntarily provided by cell phone users, particularly those who believe they're experiencing health effects. Post-market surveillance hadn't been done before, and the registry does that. It will help direct future research of potential health effects related to cell phone use. In the end, we did the best we could to get some benefit for consumers."

PROTECTION IS KEY

To repair damage and build the body's defenses against the onslaught of EMR, supplements—along with dietary changes, stress reduction, weight control and exercise—make you stronger, more balanced, and better able to face the assaults of EMR. Antioxidant supplements that fight free radicals are especially desirable.

Says Dr. Carlo: "You as a human being are put under siege by the electromagnetic soup we're swimming in, and this isn't hyperbole, it's true. When you answer your cell phone, radio signals are around you. Just because you can't see it doesn't mean it's not there. Our general ability to compensate for those insults is becoming compromised by the ever-increasing background of EMR."

Taking as many precautions as you can goes a long way to reducing the risks. However, Dr. Carlo cautions that there is no silver bullet solution. "It's a complicated problem, and while we tend to look for a quick fix, there is none here. Over the next decade, I hope we figure out how to change the way signals are transmitted. A thousand years from now we will have evolved, but that's not helping us now. This will take time, but consumers have to be empowered to help themselves in the interim."

EUROPEAN RESEARCH CONFIRMS CELL PHONE DANGERS

The industry took its tricks elsewhere—to Europe, which had picked up the ball and began funding independent research to corroborate or confirm the work of Dr. Carlo and his team. The work was completed in mid-2004 and when it was released,[12] it not only provided independent scientific corroboration of the work done by Dr. Carlo's group, but also took the work a step further and showed how the problems were occurring mechanistically. This information formed a biologically plausible hypothesis for how cell phone radiation could be related to so many diseases.

Dr. Carlo noted, “The industry exerted pressure on the scientists who conducted the work, including renowned German scientist Dr. Franz Adlkofer. It first tried to change the conclusions of the work, then to delay its public release. Then Dr. Adlkofer, the lead scientist, was attacked in the media and threatened privately with no more research money, a ruined reputation—similar to what we experienced in the WTR. But this situation attracted the attention of a German documentary filmmaker, who decided to do a film on the cell phone issue.”

It was enough to bring Dr. Carlo into view again, as he was asked to participate. The film, The Boiling Frog Principle, by Klaus Scheidsteger, builds on information from his first film, The Cell Phone War, and will be released in 2007. Its intent is to integrate the latest political and scientific evidence from around the world, and bring forth to consumers important information on cell phone dangers that was previously withheld.

ECONOMIC IMPLICATIONS

Currently in the US, there are seven class action lawsuits moving forward against the cell phone industry, says Dr. Carlo, and nine other cases that are personal injury cases brought by people with brain cancer. In the past two years, two workers compensation awards were given to people with brain tumors based on a link between their tumors and their cell phone use in the workplace. Both of these cases occurred in California.

“What we have now is a major litigation burden, a vulnerability the cell phone industry has never before been under,” Dr. Carlo says. “They’re uninsured for these health risk claims and are already positioning themselves for a congressional bailout, like the Savings and Loan crisis of the late 1980s. They’ll lose a couple of these lawsuits and once they do, there’ll be an onslaught of new litigation against them.”

The country can’t afford for the cell phone industry to go under, Dr. Carlo says, as it would have a disastrous impact on the entire economy—some estimates say over 30% of investment stocks in retirement funds are tied to telecommunications shares. That’s why Congress will figure out a way to bail out the industry.

“The industry thinks they can afford to continue on with this institutional arrogance, endangering millions of men, women and children because, at the end of the day, they believe they’ll not be held accountable. They think they can continue to manipulate consumers.”

A LOOMING HEALTH CRISIS

It’s been nearly 12 years since the WTR was funded. Despite Dr. Carlo’s revealing research and the corroborating research of other scientists from around the world that continue to follow, a search of media reports today on the subject of cell phone dangers tends to suggest one of only two conclusions: There is no risk, or no one has yet proven the risk. That’s at odds with more than 300 studies in the peer-reviewed scientific literature supporting an increased risk of disease. Clearly, something doesn’t add up.

The industry’s manipulation of the media to consider only one study at a time obfuscates the big picture.Individually, there’s little to see. But the depth and breadth of the science that points to the problem, and the compilation of studies, make the future look frightening. Like the September 11 tragedy, where no one in government talked to each other and did not see it coming for lack of a big picture view, the health crisis from cell phone use looms darkly.

“When you put all the science together, we come to the irrefutable conclusion that there’s a major health crisis coming, probably already underway,” warns Dr. Carlo. “Not just cancer, but also learning disabilities, attention deficit disorder, autism, Alzheimer’s, Parkinson’s, and psychological and behavioral problems—all mediated by the same mechanism. That’s why we’re so worried. Time is running out. When you put the pieces of the puzzle together, it’s such a wide ranging problem. It’s unlike anything we’ve ever seen before.”

PROTECTING YOURSELF

The most effective technique for protecting yourself against the dangers of cell phone radiation is keeping the phone at a distance from the body. Simply using a hands-free headset is a big step. Headsets keep the cell phone’s antenna at a distance of six to seven inches away from the body, thus eliminating near-field exposure. Wired headsets can act as an antenna to draw some ambient EMR, but not much, so using one is still preferable to holding the phone to your head. Wireless headsets should be avoided, as they draw much more far-field EMR.

The safest headsets have hollow air tubes, similar to those used in stethoscopes, instead of wires.They offer protection against both near-field and far-field exposure. If possible, avoid wearing the phone at your waist, which exposes the hip bones to radiation. Eighty percent of red blood cells are formed in the hip bones. There are also newer cell phones available capable of functioning in

speaker phone mode. This enables you to talk on the phone while keeping it at a safe distance from your body. If you are able to conduct most of your conversations using a speaker phone, this could enable you to use a cell phone without encountering the intense radiation exposure that occurs when holding it to your ear.

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NUTRITIONAL PROTECTION AGAINST CELL PHONE RADIATION

As growing evidence points to the potential adverse health impact of exposure to cell phone radiation, scientists are seeking strategies to prevent or mitigate these effects. Currently, nutritional researchers are exploring whether melatonin, vitamin C, and and vitamin E can ameliorate the detrimental effects caused by radiation emitted by cell phones.

To date, a total of eight studies have pointed to the protective effects of melatonin and vitamins C and E in stemming the damage caused by cell phone emissions. In particular, these agents show promise in averting the increased oxidative stress that is thought to contribute to an increased risk of certain cancers. These studies have unveiled statistically significant protective effects of melatonin and vitamins C and E against the effects of the radiation frequency at which cell phones emit and receive radio frequency radiation.

Six of these eight studies were controlled, short-term studies (ranging from 10-30 days) in rodents. Each study examined 24-30 subjects. Study subjects were divided equally into three groups: one group received radiation exposure; another received active treatment with melatonin only, vitamin C only, or vitamins C and E before radiation exposure; and a control group did not receive radiation or active treatment. After the treatment period, scientists examined skin sections for radiation injury and analyzed blood and urine for markers of oxidative stress. They found significant kidney damage, skin changes, oxidative stress, and fibrosis in the animals who received radiation exposure only. Remarkably, these effects were reversed in the groups that received melatonin[13-16] and vitamins C[17,18] and E.[17]

Another two controlled studies in rodents, one of 10 days'[19] and another of 60 days' duration,[20] revealed that melatonin significantly protects against retinal (eye)[20] and kidney tissue[19] damage caused by cell phone radiation, as compared with subjects that did not receive melatonin.

Despite this compelling evidence, other avenues of research still need to be pursued after contradictory findings from seven different studies that have looked into the effect of cell phone radiation on melatonin levels in the body.

In one study, melatonin levels in the blood were measured in 226 male electric utility workers who were categorized according to cell phone use. The study concluded that workers who used cell phones for more than 25 minutes per day had decreased melatonin production and revealed a relationship between increased cell phone use and decreasing melatonin levels in the blood.[21]

Yet six other studies—two in humans[22,23] and four in rodents[24-27]— found that melatonin levels remained unchanged after radiation exposure. One human study did suggest that cell phone radiation may impact melatonin onset time. These were small studies, however, the majority of which were less than 28 days' duration.

Melatonin is a vital natural neurohormone (hormone secreted by or acting on a part of the nervous system) that acts as a potent free radical scavenger and antioxidant. Melatonin regulates the daily circadian rhythm and is essential to self-repair and regeneration. Given melatonin's protective effects, these findings warrant further research into the effect of cell phone radiation on melatonin in larger, longer-term, well-controlled human studies.

—Bina Singh

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WELL

Experts Revive Debate Over Cellphones and Cancer

By TARA PARKER-POPE

What do brain surgeons know about cellphone safety that the rest of us don't?

Last week, three prominent neurosurgeons told the CNN interviewer Larry King that they did not hold cellphones next to their ears. "I think the safe practice," said Dr. Keith Black, a surgeon at Cedars-Sinai Medical Center in Los Angeles, "is to use an earpiece so you keep the microwave antenna away from your brain."

Dr. Vini Khurana, an associate professor of neurosurgery at the Australian National University who is an outspoken critic of cellphones, said: "I use it on the speaker-phone mode. I do not hold it to my ear." And CNN's chief medical correspondent, Dr. Sanjay Gupta, a neurosurgeon at Emory University Hospital, said that like Dr. Black he used an earpiece.

Along with Senator Edward M. Kennedy's recent diagnosis of a glioma, a type of tumor that critics have long associated with cellphone use, the doctors' remarks have helped reignite a long-simmering debate about cellphones and cancer.

That supposed link has been largely dismissed by many experts, including the American Cancer Society. The theory that cellphones cause brain tumors "defies credulity," said Dr. Eugene Flamm, chairman of neurosurgery at Montefiore Medical Center.

According to the Food and Drug Administration, three large epidemiology studies since 2000 have shown no harmful effects. CTIA — the Wireless Association, the leading industry trade group, said in a statement, "The overwhelming majority of studies that have been published in scientific journals around the globe show that wireless phones do not pose a health risk."

The F.D.A. notes, however, that the average period of phone use in the studies it cites was about three years, so the research doesn't answer questions about long-term exposures. Critics say many studies are flawed for that reason, and also because they do not distinguish between casual and heavy use.

Cellphones emit non-ionizing radiation, waves of energy that are too weak to break chemical bonds or to set off the DNA damage known to cause cancer. There is no known biological mechanism to explain how non-ionizing radiation might lead to cancer.

But researchers who have raised concerns say that just because science can't explain the mechanism doesn't mean one doesn't exist. Concerns have focused on the heat generated by cellphones and the fact that the radio frequencies are absorbed mostly by the head and neck. In recent studies that suggest a risk, the tumors tend to occur on the same side of the head where the patient typically holds the phone.

Like most research on the subject, the studies are observational, showing only an association between

cellphone use and cancer, not a causal relationship. The most important of these studies is called Interphone, a vast research effort in 13 countries, including Canada, Israel and several in Europe.

Some of the research suggests a link between cellphone use and three types of tumors: glioma; cancer of the parotid, a salivary gland near the ear; and acoustic neuroma, a tumor that essentially occurs where the ear meets the brain. All these cancers are rare, so even if cellphone use does increase risk, the risk is still very low.

Last year, The American Journal of Epidemiology published data from Israel finding a 58 percent higher risk of parotid gland tumors among heavy cellphone users. Also last year, a Swedish analysis of 16 studies in the journal Occupational and Environmental Medicine showed a doubling of risk for acoustic neuroma and glioma after 10 years of heavy cellphone use.

“What we’re seeing is suggestions in epidemiological studies that have looked at people using phones for 10 or more years,” says Louis Slesin, editor of Microwave News, an industry publication that tracks the research. “There are some very disconcerting findings that suggest a problem, although it’s much too early to reach a conclusive view.”

Some doctors say the real concern is not older cellphone users, who began using phones as adults, but children who are beginning to use phones today and face a lifetime of exposure.

“More and more kids are using cellphones,” said Dr. Paul J. Rosch, clinical professor of medicine and psychiatry at New York Medical College. “They may be much more affected. Their brains are growing rapidly, and their skulls are thinner.”

For people who are concerned about any possible risk, a simple solution is to use a headset. Of course, that option isn’t always convenient, and some critics have raised worries about wireless devices like the Bluetooth that essentially place a transmitter in the ear.

The fear is that even if the individual risk of using a cellphone is low, with three billion users worldwide, even a minuscule risk would translate into a major public health concern.

“We cannot say with any certainty that cellphones are either safe or not safe,” Dr. Black said on CNN. “My concern is that with the widespread use of cellphones, the worst scenario would be that we get the definitive study 10 years from now, and we find out there is a correlation.”

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EPIDEMIOLOGY

Mobile Phone Use and the Risk of Acoustic Neuroma.

Epidemiology. 15(6):653-659, November 2004.
*Lonn, Stefan *; Ahlbom, Anders *; Hall, Per +; Feychting, Maria **

Abstract:
Background: Radiofrequency exposure from mobile phones is concentrated to the tissue closest to the handset, which includes the auditory nerve. If this type of exposure increases tumor risk, acoustic neuroma would be a potential concern.

Methods: In this population-based case-control study we identified all cases age 20 to 69 years diagnosed with acoustic neuroma during 1999 to 2002 in certain parts of Sweden. Controls were randomly selected from the study base, stratified on age, sex, and residential area. Detailed information about mobile phone use and other environmental exposures was collected from 148 (93%) cases and 604 (72%) controls.

Results: The overall odds ratio for acoustic neuroma associated with regular mobile phone use was 1.0 (95% confidence interval = 0.6-1.5). Ten years after the start of mobile phone use the estimates relative risk increased to 1.9 (0.9-4.1); when restricting to tumors on the same side of the head as the phone was normally used, the relative risk was 3.9 (1.6-9.5).

Conclusions: Our findings do not indicate an increased risk of acoustic neuroma related to short-term mobile phone use after a short latency period. However, our data suggest an increased risk of acoustic neuroma associated with mobile phone use of at least 10 years' duration.

POLL

Cell phone health warning debated in Augusta

Convenience vs. radiation

BANGOR DAILY NEWS PHOTO BY BRIDGET BROWN

Dr. Dora Anne Mills (right), director of the Maine Center for Disease Control and Prevention, talks on her cell phone prior to testifying in opposition to Rep. Andrea Boland's bill LD 1706, An Act To Create the Children's Wireless Protection Act, during a public hearing at the State House in Augusta on Tuesday. ***Buy Photo***




3/2/10 10:46 am Updated: 3/2/10 08:53 pm

By Meg Haskell
BDN Staff

AUGUSTA, Maine — Cell phones are virtually everywhere in our society, providing wireless, pocket-sized safety and convenience to great-grandparents, business professionals, soccer moms, teenagers and, increasingly, young children. But are they safe?

On Tuesday, the Legislature's Health and Human Services Committee heard from national advocates claiming that cell phone use is linked to brain cancer and other disorders and calling for a prominent and graphic warning label on every unit sold in Maine.

Maine would become the first state with such a requirement.

Opponents, including Maine's top public health official as well as representatives of the wireless industry, called the proposal misguided and inflammatory and said it would conflict with federal regulatory policies.

Today's Poll

Do you think there is a link between cell phones and brain cancer?

Yes

The bill, **LD 1706**, sponsored by Rep. Andrea Boland, D-Sanford, would require cell phone manufacturers to apply a permanent, nonremovable warning label to every unit

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sold in Maine. The label would cover at least 30 percent of the plain area of the phone and caution users to hold the unit several inches away from their heads or to use earphone-and-speaker technology.

Boland testified that a warning label is an easy way to alert people to the dangers cell phones can pose. “No one is suggesting we don’t use cell phones,” she said. “We’re only suggesting people use them safely.”

The label also would include a color graphic of the brain of a 5-year-old child showing the extent to which radiation from a cell phone is absorbed. The illustration would be drawn from the recent research of professor Om Gandhi of the University of Utah, who has studied the relative absorption and effect of cell phone radiation on the brains of children and adults. Gandhi was among a number of scientific experts who traveled to Augusta on Tuesday for the public hearing before the HHS committee.

Several individuals told the committee stories of personal tragedy, including Ellie and Alan Marks, who traveled to Augusta from their home in San Francisco. Realtor Alan Marks told lawmakers he was diagnosed two years ago with a malignant brain tumor on the right side of his brain — the same side as the ear he used most when on his cell phone.

“It was malignant and it was my death sentence,” he said. Marks said physicians and scientists “around the world” have determined that the tumor was directly attributable to his long-term use of a cellular telephone.

Marks said that if he had had any idea that cell phones have been linked with brain cancers, he would have altered his use of the devices.

“I wish I could go back 23 years and start over by never holding that thing to my head,” he said. “But I can’t. All I can do is let others know my story.” Marks accused the cell phone industry of denying and disregarding growing evidence that use of the devices is related to brain tumor development.

That evidence includes a recent study by Dr. Franz Adlkofer, a biologist and professor of internal medicine in Munich, Germany. Adlkofer told the committee that the kind of electromagnetic radiation emitted by cell phones damages DNA strands, setting the stage for many disorders, including cancer.

“Special attention should be given to the most frequent users of this technology, children and adolescents, who are also the most vulnerable members of our society,” he said in his testimony in support of a warning label.

Professor Devra Davis of Mount Sinai Medical Center in New York said recent studies of people who have used cell phones for 10 years or longer show a clear connection to cancers of the brain, salivary glands and acoustic nerves, as well as less deadly problems ranging from reduced sperm count to insomnia.

Davis cautioned that older safety studies referenced by the cell phone industry looked at subjects who had been using the technology only for a few years. She said it can take 20 or 30 years for cancer to develop and that increased use among youngsters poses a heightened risk.

Local supporters of the bill included Dr. Meryl Nass, a physician from Bar Harbor who specializes in toxic exposures and “odd illnesses,” and Michael Belliveau of the Maine-based Environmental Health Strategy Center. In his testimony, Belliveau said the “three irrefutable facts” about cell phones — that they expose the hu-man brain to radiation, that radiation causes biological changes in human cells, and that some studies link cell phone use to brain cancer in humans — are reason enough to alert consumers to the potential dangers of the technology and encourage them to reduce exposure among children and adopt the use of hands-free devices.

But Dr. Dora Anne Mills, director of the Maine Center for Disease Control and Prevention, referenced a number of U.S. and international agencies and said there is not sufficient evidence of harm to require a warning label on cell phones.

The state could require warnings on “everything from apples to xylophones,” which would only result in “an overwhelmed and turned-off public,” she said. Mills noted that cell phones are often key to providing safety and security for children and their families.

Dane Snowden of CTIA, the international association for the wireless communications industry, also spoke against the measure on the grounds that there is insufficient evidence of danger. The warning specified in the bill "strongly suggests a safety concern that is unfounded, unsupported and contrary to the views of interna-tional health organizations and government agencies regarding the safety of wireless devices," he said in his testimony. He also said the measure would violate federal rules regarding states' ability to regulate telecommunications technology.

Curtis Picard of the Maine Merchants Association argued the warning could drive down cell phone sales, adversely affecting Maine businesses.

The committee's work session on Boland's bill is scheduled for 1 p.m. Tuesday, March 9, in Room 209 of the Cross State Office Building.
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Learn About EMFs

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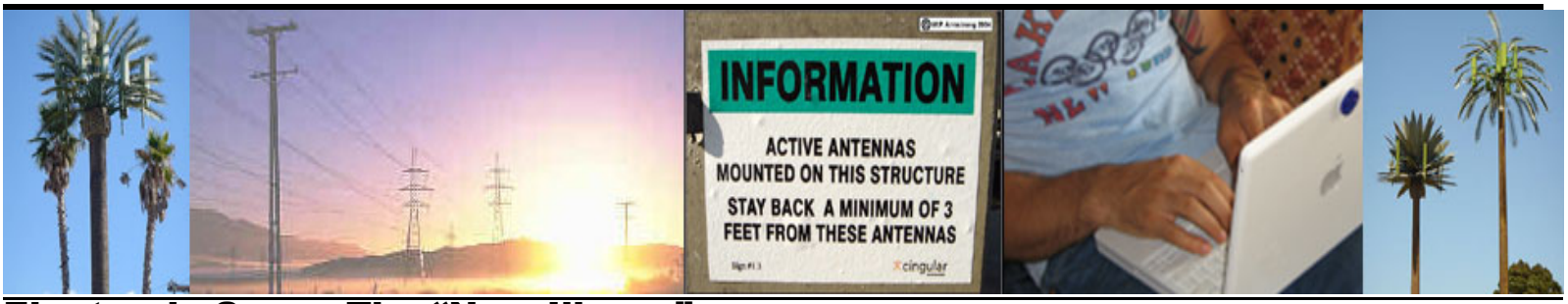

Electronic Smog: The "New Illness"

February 14th, 2008 · No Comments

The curse of the mobile phone age: around your home there are countless gadgets whose electrical fields, scientists now warn, are linked to depression, miscarriage and cancer.

The evidence - which is being taken seriously by national and international bodies and authorities - suggests that almost everyone is being exposed to a new form of pollution with countless sources in daily use in every home.

Two official Department of Health reports on the smog are to be presented to ministers next month, and the Health Protection Agency (HPA) has recently held the first meeting of an expert group charged with developing advice to the public on the threat.

The UN's World Health Organisation (WHO) calls the electronic smog "one of the most common and fastest growing environmental influences" and stresses that it "takes seriously" concerns about the health effects. It adds that "everyone in the world" is exposed to it and that "levels will continue to increase as technology advances".

Wiring creates electrical fields, one component of the smog, even when nothing is turned on. And all electrical equipment - from TVs to toasters - give off another one, magnetic fields. The fields rapidly decrease with distance but appliances such as hair dryers and electric shavers, used close to the head, can give high exposures. Electric blankets and clock radios near to beds produce even higher doses because people are exposed to them for many hours while sleeping.

Radio frequency fields - yet another component - are emitted by microwave ovens, TV and radio transmitters, mobile phone masts and phones themselves, also used close to the head.

The WHO says that the smog could interfere with the tiny natural electrical currents that help to drive the human body. Nerves relay signals by transmitting electric impulses, for example, while the use of electrocardiograms testify to the electrical activity of the heart.

Campaigners have long been worried about exposure to fields from lines carried by electric pylons but, until recently, their concerns were dismissed, even ridiculed, by the authorities.

But last year a study by the official National Radiological Protection Board concluded that children living close to the lines are more likely to get leukaemia, and ministers are considering whether to stop any more homes being built near them. The discovery is causing a large-scale reappraisal of the hazards of the smog.

The International Agency for Research on Cancer - part of the WHO and the leading international organisation on the disease - classes the smog as a “possible human carcinogen”. And Professor David Carpenter, dean of the School of Public Health at the State University of New York, told The Independent on Sunday last week that it was likely to cause up to 30 per cent of all childhood cancers. A report by the California Health Department concludes that it is also likely to cause adult leukaemia, brain cancers and possibly breast cancer and could be responsible for a 10th of all miscarriages.

Professor Denis Henshaw, professor of human radiation effects at Bristol University, says that “a huge and substantive body of evidence indicates a range of adverse health effects”. He estimates that the smog causes some 9,000 cases of depression.

Perhaps strangest of all, there is increasing evidence that the smog causes some people to become allergic to electricity, leading to nausea, pain, dizziness, depression and difficulties in sleeping and concentrating when they use electrical appliances or go near mobile phone masts. Some are so badly affected that they have to change their lifestyles.

While not yet certain how it is caused, both the WHO and the HPA accept that the condition exists, and the UN body estimates that up to three in every 100 people are affected by it.

Case History: ‘I felt I was going into meltdown’

Until a year ago, Sarah Dacre reckoned she had a “blessed life”. Running her own company, and living in an expensive north London home, the high-earning divorcee described herself as “fab, fit and 40s”. Then suddenly the sight in her right eye failed: she first noticed it when she was unable to read an A-Z map. Soon she was getting pains and numbness in her joints. She could not sleep and spent nights “pacing about like a caged lion”. Her short-term memory failed and if she took notes to remind her, she would forget she had made them.

The symptoms got worse whenever she was exposed to electricity. She could not use a computer for more than five minutes without becoming nauseous. Even using a telephone landline gave her a buzzing in the ear and made her feel she was "going into meltdown".

Source: The Independent

Tags: Electronic Smog · Electrosmog · EMF Pollution → **No Comments**

International EMF Safety Regulations on Cell Phone Tower Radiation Flawed

February 13th, 2008 · No Comments

In 1998 an international committee called the International Commission on Non-Ionizing Radiation Protection (ICNIRP) set radiation and EMF safety limits.

The problem is, the ICNIRP only took into consideration the short term effect of EMF exposure.

"...Induction of cancer from long term EMF exposure was not considered to be established, and so these guidelines are based on short-term, immediate health effects," reads their report.

This means the ICNIRP only bothered to look at the short term heating or thermal effects of radiation. They have completely overlooked the fact radiation is cumulative in the human body and ingnored the long-term consequences associated with cumulative radiation exposure.

Despite this, the Independent Expert Group on Mobile Phones (known as the Stewart Report) released their expert report on the safety of moblie phones/masts in 2000 and, concluded that the emf emissions from cell phone towers do not cause adverse health conditions because they are below ICNIRP levels.

In the words of Woody Allen, you can be a complete intellectual and still have no idea what's going on.

SO while the 'experts' wax poetically on the safety of cell phone tower emissions, a number of independent scientists were busy lambasting the ICNIRP findings and citing that there were "strong political/economic reasons for wanting there to be no adverse health effect." (1)

Other words used to describe the ICNIRP findings by various EMF researchers such as Dr. Don Maisch, Dr. Gerald Hyland, Dr. Neil Cherry were "blatantly incorrect...biased...a serious misinterpretation of the facts...the cancer assesment is misleading, inappropriate and flawed...risk assesment based on a house of cards...highly selective...unscientific."

Although the Stewart Report 2000 reported no adverse health effects associated with cell phone tower radiation, they did recommend that cell phone towers not be allowed within a certain distance from schools. As of 2008 cell phone companies continue to place antennas and towers near schools, this angle of the expert report has been conveniently overlooked.

Footnotes:
(1) Britishlibrary.net/orange/biologeffects.htm (British Library is now defunct)

Tags: Cell Phone Tower Radiation

→ No Comments

Title: Cell phone radiation exposure on brain and associated biological systems.

Authors: Kesari, Kavindra Kumar, Siddiqui, Mohd Haris Meena, Ramovatar Verma, H N Kumar, Shivendra

Keywords: Cancer

Mobile phone

Reactive oxygen species

Tumor formation

Issue Date: Mar-2013

Citation: Kesari Kavindra Kumar, Siddiqui Mohd Haris, Meena Ramovatar, Verma H N, Kumar Shivendra. Cell phone radiation exposure on brain and associated biological systems. Indian Journal of Experimental Biology. 2013 Mar; 51(3): 187-200.

Abstract: Wireless technologies are ubiquitous today and the mobile phones are one of the prodigious output of this technology. Although the familiarization and dependency of mobile phones is growing at an alarming pace, the biological effects due to the exposure of radiations have become a subject of intense debate. The present evidence on mobile phone radiation exposure is based on scientific research and public policy initiative to give an overview of what is known of biological effects that occur at radiofrequency (RF)/ electromagnetic fields (EMFs) exposure. The conflict in conclusions is mainly because of difficulty in controlling the affecting parameters. Biological effects are dependent not only on the distance and size of the object (with respect to the object) but also on the environmental parameters. Health endpoints reported to be associated with RF include childhood leukemia, brain tumors, genotoxic effects, neurological effects and neurodegenerative diseases, immune system deregulation, allergic and inflammatory responses, infertility and some cardiovascular effects. Most of the reports conclude a reasonable suspicion of mobile phone risk that exists based on clear evidence of bio-effects which with prolonged exposures may reasonably be presumed to result in health impacts. The present study summarizes the public issue based on mobile phone radiation exposure and their biological effects. This review concludes that the regular and long term use of microwave devices (mobile phone, microwave oven) at domestic level can have negative impact upon biological system especially on brain. It also suggests that increased reactive oxygen species (ROS) play an important role by enhancing the effect of microwave radiations which may cause neurodegenerative diseases.

SPANDIDOS PUBLICATIONS

Mobile phone radiation causes brain tumors and should be classified as a probable human carcinogen (2A) (Review)

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Abstract

Quickly changing technologies and intensive uses of radiofrequency electromagnetic field (RF-EMF)-emitting phones pose a challenge to public health. Mobile phone users and uses and exposures to other wireless transmitting devices (WTDs) have increased in the past few years. We consider that CERENAT, a French national study, provides an important addition to the literature evaluating the use of mobile phones and risk of brain tumors. The CERENAT finding of increased risk of glioma is consistent with studies that evaluated use of mobile phones for a decade or longer and corroborate those that have shown a risk of meningioma from mobile phone use. In CERENAT, exposure to RF-EMF from digitally enhanced cordless telephones (DECTs), used by over half the population of France during the period of this study, was not evaluated. If exposures to DECT phones could have been taken into account, the risks of glioma from mobile phone use in CERENAT are likely to be higher than published. We conclude that radiofrequency fields should be classified as a Group 2A probable human carcinogen under the criteria used by the International Agency for Research on Cancer (Lyon, France). Additional data should be gathered on exposures to mobile and cordless phones, other WTDs, mobile phone base stations and Wi-Fi routers to evaluate their impact on public health. We advise that the as low as reasonable achievable (ALARA) principle be adopted for uses of this technology, while a major cross-disciplinary effort is generated to train researchers in bioelectromagnetics and provide monitoring of potential health impacts of RF-EMF.

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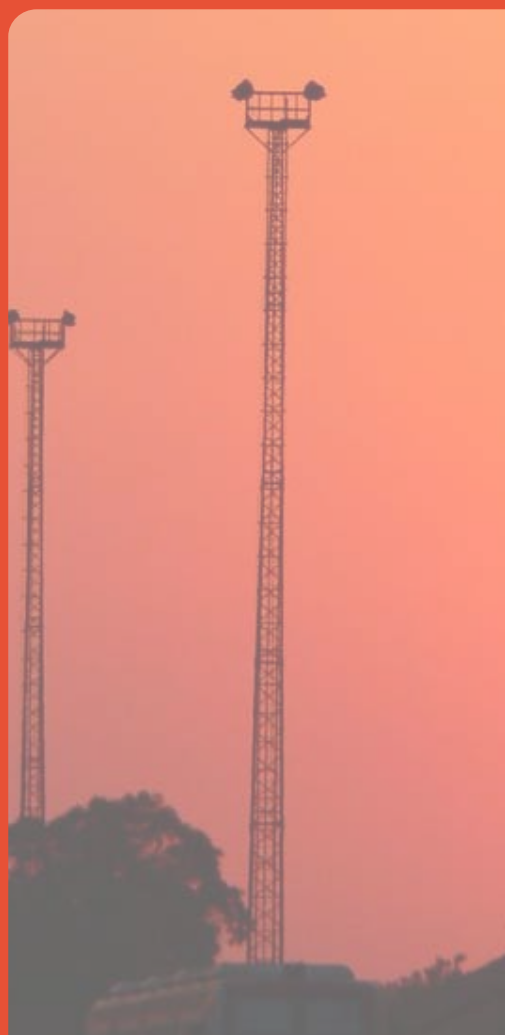

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