Electro Magnetic Field (EMF)

Nabeel Kouka, MD, DO, MBA

April 9, 2000 - New Jersey, USA

Introduction

Electromagnetic radiation or electromagnetic fields, commonly known as EMFs, are all around us. EMFs are found everywhere that electricity is in use and around any object that has an electric charge. EMFs are invisible lines of force that surround all electrical devices and wiring. Any time an electric current runs through a wire or an appliance, it produces an EMF. Electromagnetic radiation from Extremely Low Frequency (ELF), Radio Frequency (RF), and Microwave Frequency emissions are harmful to all living things.

Before humans harnessed electricity, the only electromagnetic radiation we were exposed to came from the forces of nature, from gamma rays and sunlight to the magnetic field of the earth. Many of today's technological applications use or produce electromagnetic energy.

For the last century, technology has been a blessing to all human beings. The newly developed innovations and inventions have reduced the time needed to accomplish our goals and drastically improved the overall quality of our lives. Familiar examples include electrical lighting and appliances, computers, computer monitors, and microwave ovens, radios, TVs, and cellular phones, broadcast stations, surveillance systems and communications satellites.

Many writers and even researchers have already embraced the enormous and wonderful effects of this technology on our lives. The first warning of the dangers of this technology occurred in 1972 when the Soviet Union reported strange health effects in switchyard workers who were regularly exposed to high levels of EMF. Since then, scientists have been questioning whether this technology is causing more harm than benefits, not only for humans, but also for every living thing including animals and plants. This is because of the association of electromagnetic fields with increased behavioral changes and health problems such as epilepsy, leukemia, cancer, brain tumors, and other serious disorders. Many scientists and physicians suggest a link between these disorders and long-term exposure to EMF.

There has long been a scientific debate amongst researchers and it seems that for every study, which supports this link, there is an equally contrary finding in another study. Yet, in a 1989 report to the Congressional Office if Technology Assessment, Dr. Janet Healer stated: "Studies over the last fifteen years have demonstrated unequivocally that under certain circumstances, the membranes of cells can be sensitive to even fairly weak externally imposed low frequency electromagnetic fields. Extremely small signals can trigger major biochemical responses critical to the functioning of the cell." Enough evidence has been reported to date to at least justify further investigation into the possible health effects of the electromagnetic radiation.

Yet, the government, electric utility and communications industry, and manufacturers maintain that there's not enough evidence to make them take action. This is the same thing that was about asbestos for years until it was proven to be harmful. Tobacco companies still insist that smoking does not cause cancer. (Is this still true?) Lead manufacturers denied that lead added to paint was a hazard to children and it took fifty years before it was removed from paint and longer before it was removed from gasoline. The utility and communications industry are wealthy and powerful organizations and there is a danger that scientists who accept funds from them will have their public position biased by their financial support.

In 1990, the Environmental Protection Agency (EPA), the federal agency charged with warning the public about health problems in the environment, conducted a comprehensive review of available EMF studies and published a report recommendation that power line ELF's be declared a probable carcinogen, and radio waves and microwaves be declared possible carcinogens. The White house and the Air Force declared that the report should not be published on grounds of national security and that it would alarm the public. The report was put on hold until the administration of the EPA changed the conclusions to say that there was no proven effect and the EPA has never officially released the report in its final form. Time magazine reported, "The EPA has put forward what amounts to the most serious government warning to date. The agency tentatively concluded that scientific evidence 'suggests a causal link' between extremely low frequency electromagnetic fields and leukemia, lymphoma, and brain cancer … (the report) does identify the common 60 Hz magnetic fields as a possible, but not proven, cause of cancer in humans."

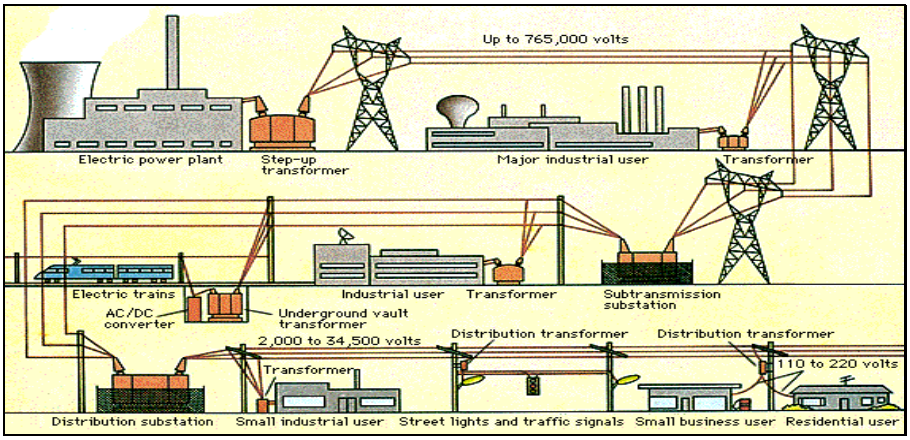
Most recently, the price of technological progress has grown due to the expansion of the wireless communications industry and society's additional exposure to this new source of EMF. As the wireless communications industry further expands, the electromagnetic signature of the world is being altered with no clear understanding of the implications to humans and other species.

Millions of people are at risk and a lot of people can suffer or die before it's proven beyond a shadow of a doubt that electromagnetic radiation is truly dangerous. Until the EMFs are exonerated, avoidance of them is a reasonable policy. We advocate what has been termed "prudent avoidance", "the concept of protecting yourself from exposures that is probably but not definitely harmful, if the actions required are neither unreasonably expensive nor disruptive."

This paper focuses on the possible hazardous health effects of EMF, its sources, how to measure and detect the EMF, avoidance of EMF, and the managerial impacts on businesses and manufacturers in dealing with the hazards introduced by technological innovations and inventions.

Electric Power

In order to understand EMFs that are found everywhere electricity is in use, we need to have a basic understanding of electric power. The electrical power system is a large power grid, which crosses the country and provides us with energy to light our homes and run appliances.



The electrical power system has power lines to carry current (movement of electrons or the electrical charge through the line) and transformers to change its voltage (electrical force that causes current in a line or potential amount of electrical energy in a line). Electric power is generated in power plants that are usually located in rural areas. Step-up transformers boost voltages (up to 765 Kv) so that current can be carried long distances. Transmission lines, or high voltage power lines, efficiently carry electric power over long distances to substations near user communities. (The transmission lines are usually mounted on 50-meter high metal structures with a

space age look to them.) Substations and step-down transformers reduce voltages to levels needed by consumers. Utilities use lower voltage distribution lines (<50 Kv) to bring power from substations to our homes and businesses. For residential customers, the voltage is further reduced to 120/240 volts once the power reaches its destination. In general, transmission lines handle lower voltages and currents than distribution lines except during peak power use. During peak power use, the amount of current traveling over distribution lines can actually be as high as the current in a transmission line.

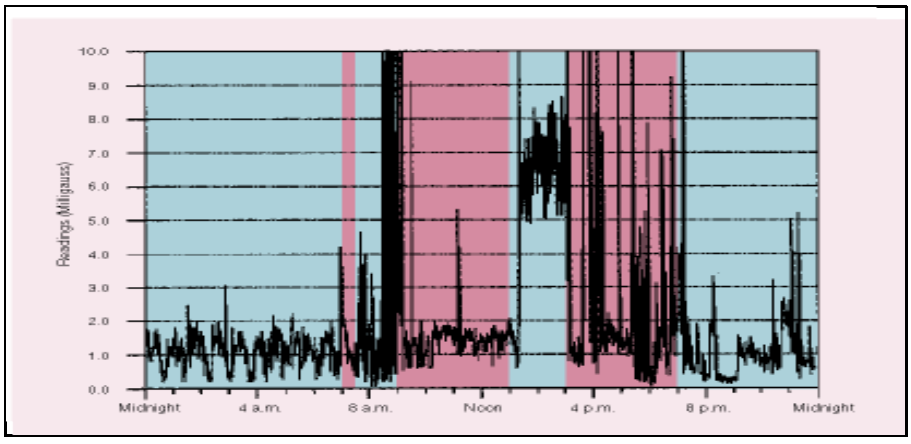
As demand for electricity continues to grow, there has been an increase in both the number and length of power lines crossing the country. According to the Department of Energy, in 1992, there were 350,000 miles of transmission lines and 2 million miles of distribution lines in the U.S.

In the U.S., we have a 60-Hertz (Hz) Alternating Current (AC) power system. A 60 Hz AC means that the electrical current that runs through the power lines and wall wiring doesn't just flow in one direction – it alternates back and forth at a rate of 60 cycles per second. (The current in batteries flows in a single direction, from the batteries to the appliance, so it is called Direct Current, or DC.) The 60 Hz AC system and all appliances that run on it produce 60 Hz EMF. At this frequency, electromagnetic fields are known as Extremely Low Frequency (ELF) EMF. These AC fields induce weak electrical currents in conducting objects, including humans. The cells in living organisms naturally maintain an electric charge across their membranes that are essential to the normal functioning of the human tissue. Theses cells are extremely sensitive to very weak electromagnetic fields and this is a reason why there is a potential for EMFs to cause biological effects.

Electromagnetic Fields (EMFs)

Electromagnetic radiation is energy radiated in the form of a wave caused by an electric field interacting with a magnetic field that is produced when electrical charges are accelerated. Normally, electric and magnetic fields occur together and both electric and magnetic field weaken with increasing distance from the source. Yet, electric and magnetic fields are different in important ways and are known to have different effects on living things. When EMFs interact with living things, the electric and magnetic fields separate and affect organisms separately. Although electric fields are present whether an appliance is on or off, a magnetic field will disappear as soon as the appliance is turned off. Whereas electric fields can be easily shielded or weakened by conducting objects such as buildings, trees, and human skin, magnetic fields cannot. Magnetic fields are difficult to weaken because they are able to pass through anything that doesn't contain a high degree of iron. This difference is critical because it is believed that the dangers of EMFs come from their magnetic field component and not from the electric fields. The human body is a very good conductor. Therefore, when you stand in an electromagnetic field, you become an antenna and are not even aware of it.

In our everyday life, we are exposed to electromagnetic fields all the time without knowing it. The strength of the fields varies throughout the day, indoors and outdoors as shown in the figure below.

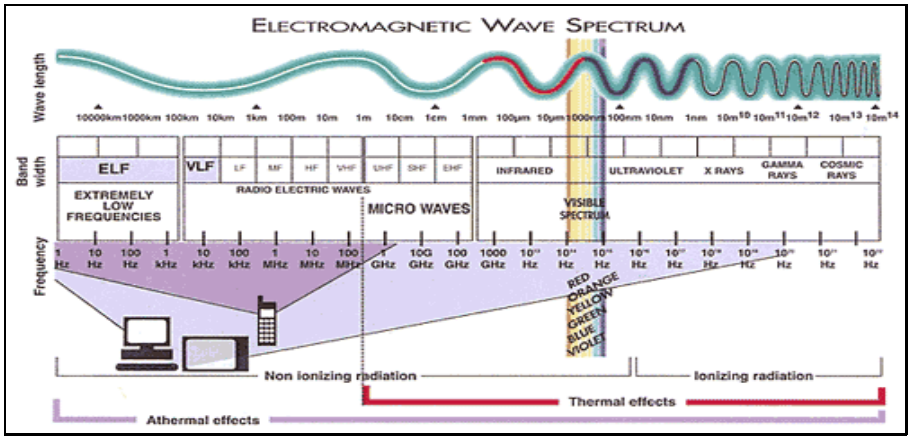


"Exposures to magnetic fields can vary widely throughout the day, as this metered log of the author's activities

one day last month illustrates. From midnight to 7 a.m., cyclic changes in fields at the head of a second-floor bed suggest a poorly wired thermostat or pump that induces spikes as the boiler in the basement turns on and off. Use of kitchen appliances from 7 to 7:30 a.m. caused small surges. Similar fluctuations between 7:30 and 8:15 depict fields as the author drove her daughter to school. Off-the-chart peaks shortly thereafter reflect commuting on the electric subway system. The 1- to 2-mG background fields from 9 a.m. to 1 p.m. were encountered at the office computer. Photocopying generated an 11 a.m. spike. The 5- to 8-mG exposures from 1 to 3 p.m. occurred during a staff party at a nearby restaurant, and the erratic spikes over the succeeding 4 hours depict fields in local shops, on the subway, and while driving the family car. Spikes between 10:30 and 11:30 p.m. took place while cleaning the kitchen, turning on the dishwasher, and changing CDs on the stereo."

Electromagnetic Spectrum

All electromagnetic radiation is classified by wavelength and frequency in the Electromagnetic Spectrum. The frequencies are expressed in cycles per second (i.e. Hz). See figure below.



All electromagnetic radiation can be classified as ionizing and non-ionizing radiation. The conventional paradigm holds that ionizing radiation, such as X-rays, causes biological effects through the breaking of molecular bonds, which can damage genetic material such as DNA and non-ionizing radiation can cause effects when the intensity is sufficient to cause heating or thermal effects. The thermal/non-thermal dividing line is used as the basis for present safety standards of electromagnetic radiation. This would mean that EMFs from things such as power lines and cellular phones are safe and have no effect as long as they don't heat you up.

Yet, it is now known that weak electromagnetic fields (weak meaning non-ionizing and below thermal levels) can cause changes in living things. For example, recall that ELF power line AC fields induce weak electrical currents in conducting objects, such as humans and animals. Also, microwave radiation is also known to be dangerous because of its non-thermal effects that produce biological changes. Microwave radiation is emitted by: broadcast radio and TV transmissions, radar, microwave ovens, and cellular phones to name just a few.

The acceptable and non-acceptable levels of EMF

How to measure EMF

EMFs, or electromagnetic fields, are created whenever a voltage or a current is present. Electrical current produces a magnetic field, while voltages produce and electric field. Although both an electric and magnetic field are present in EMFs, it is the magnetic field that has caused the most concern. The strength of the magnetic field is often expressed in units of milligauss, or mG (1/1000 Gauss).

Any appliance, machine, or electrical device that operates using alternating current AC power will generate EMFs. One question that arises is what steps can an individual task to minimize his or her daily exposure to EMFs? A major problem that we face is that it is very difficult to shield against magnetic fields. Most materials such as concrete walls, office dividers, computer monitor screen shields, lead and aluminum etc., have no effect on reducing magnetic radiation. The most effective and inexpensive way to reduce exposure to EMFs is to move away from the source. Several kinds of small meters are now available that can be carried or worn by a person to record magnetic field exposure.

An acceptable standard

The National Council of Radiation Protection Measurements (NCRP) draft report published in the July/August 1995 issue of Microwave News states the following 10 mG (1 micro Tesla) human exposure limit by **Section 8.4.1.3 Option 3**.

8.4.1.3 Option 3: *An exposure guideline of 10 mG and 100V/m: A considerable body of observations has documented bioeffects of fields of fields at these strengths across the gamut from isolated cells to animals, and in man. Although the majority of these reported effects do not fall directly in the category of hazards, many may be regarded as potentially hazardous. Since epidemiological studies point to increased cancer risks at even lower levels, a case can be made for recommending 10 mG and 100V/m as levels not to be exceeded in prolonged human exposures. Most homes and occupational environments are within these values, but it would be prudent to assume that higher levels may constitute a health risk. In the short term, a safety guideline set at this level would have significant consequences, particularly in occupational settings and close to high voltage transmission and distribution systems, but it is unlikely to disrupt the present pattern of electricity usage. These levels may be exceeded in homes close to transmission lines, distribution lines and transformer substations, in some occupational environments, and for users of devices that operate close to the body, such as hair dryers and electric blankets. From a different perspective, adoption of such a guideline would serve a dual purpose: first, as a vehicle for public instruction on potential health hazards of existing systems that generate fields above these levels, as a basis for "prudent avoidance", and second, as a point of departure in planning for acceptable field levels in future developments in housing, schooling, and the workplace, and in transportation systems, both public and private, that will be increasingly dependent on electric propulsion.*

Sources of EMF

EMFs in your Community

Power lines fire off (radiate) Extremely Low Frequency (ELF) EMF that vibrate back and forth 60 times per second. (Because these waves vibrate back and forth at 60 times per second, the same to and from movement will occur in the brain and body molecules of human beings who are exposed to them.) These magnetic fields can be particularly strong in houses that are close to high voltage transmission lines and to ordinary high current distribution lines that are found in every city and town in the U.S. Numerous studies have shown that most high magnetic fields in houses are produced by nearby power lines.

In most communities, the overhead distribution lines are most dangerous to the average person because most people do not generally come in contact with high voltage transmission lines. Overhead distribution lines are everywhere, exposing people to fields that can go up to 20 mG during peak usage. Since distribution lines are always strung on only one side of the street, you can avoid theses fields completely by crossing the street and walking on the side without the lines. Burying lines can be very effective in reducing magnetic fields.

It should be noted that there is a concern for homes, schools, and public recreational facilities that are less than 350 feet from high voltage transmission lines. Since communities have grown very rapidly and open land is at a premium, today we see many homes built with 300 ft of high voltage transmission lines. It is known that 800 ft from a 765 KV transmission line; the typical magnetic field would be 5 mG. Playgrounds and schools located near

electrical components with high magnetic fields are especially a concern because the developing child is at a greater danger of biological effects from magnetic field exposure than an adult would be.

Subways and electric trains or buses also produce high magnetic fields, both on and around them. In one study conducted, a magnetic field reading of 500 mG was obtained on an Amtrak train. Working adults in major metropolitan areas get most of their exposure, as well as exposure to the highest fields, outside of their homes and offices during transport.

In addition to these exposures, people in every community are also regularly exposed to radio frequency and microwave radiation. Some sources of radio frequency and microwave radiation are radio and TV broadcasts, weather radars, air traffic control systems, and wireless communication transmissions. These sources of EMF will be addressed in their own section.

EMFs at Home - Numerous studies have shown that most high magnetic fields in houses are produced by nearby power lines. "A pilot study conducted by Electric Power Research Institute in 1987 showed the primary sources of residential magnetic fields as: Transmission lines, distribution lines, currents in the residences grounding system, unusual wiring arrangements in the residence, and appliances." Therefore, overall magnetic field levels in a home are not greatly affected by home appliances. However, exposure varies greatly according to personal appliance use.

"In some 98% of U.S. homes, the average strength of magnetic fields, away from appliances ranges from 0.5 to 0.9 mG. Magnetic fields very close to electrical appliances are often stronger than field directly beneath power lines. However, appliance fields decrease in strength more quickly than do power line fields.

Appliances emit magnetic fields all around them, not just in front. Many large appliances have very high fields in the back where the motor is located. The magnetic field does not depend on the size of the appliance. The important thing to remember about appliance fields is that the farther away you get from the source, the lower they become, until they disappear. According to research, 95% of measured appliance fields one foot away from the source were only 1 mG. There are also great differences in the duration of exposure from various appliances.

The general rule of thumb is that three feet us a very good safety zone to establish between yourself and electrical appliances.

Magnetic Fields for Common Appliances

Appliance	6"	1'	2'	4'
Hairdryer Lowest Highest	1 700	- 70	- 10	- 1
Microwave Oven Lowest Highest	100 300	1 200	1 30	- 20
Refrigerator Lowest Highest	- 40	- 20	- 10	- 10
Toaster Lowest	5	-	-	-

Highest	10	7	-	-
Color TV Lowest Highest	- -	- 20	- 8	- 4
Washing Machine Lowest Highest	4 100	1 30	- 6	- -
Vacuum Cleaner Lowest Highest	100 700	20 200	4 50	- 10
Analog Clock Lowest Highest	- -	1 30	- 5	- 3
Window Air Conditioner Lowest Highest	- -	20 -	6 -	4 -
Drill Lowest Highest	100 200	20 40	3 6	- -
Power Saw Lowest Highest	50 1000	9 300	1 40	- 4
Electric Blanket (Conventional) Avg. Peak	2” 21.8 39.4	- -	- -	- -
Electric Blanket (Low Mag Fld) Avg. Peak	0.9 2.7	- -	- -	- -

The two most dangerous home appliances are the electric blanket and waterbed heaters. The problem with the electric blanket is that people spend 7 –8 hours a night lying in the magnetic field. The thermostat control on the electric blanket creates another problem by exposing the user to magnetic field surges. Waterbeds are worse because their heaters operate yearlong.

Hairdryers are a known source of extremely high fields and have been named as hazardous in research. This further magnified by daily use and the distance it is held from the head. A wall-mounted hairdryer allows you to

use the hairdryer and stay out of the EMF because it's the motor that puts out the EMF.

The kitchen is a likely place for high magnetic fields because a lot of appliances are going at the same time. We need to decide if we really need all the labor saving devices that are a potential health hazard.

EMFs at Work - Society is exposed to magnetic fields everyday at work. Common sources of magnetic fields at work are copy machines; fax machines, fluorescent lighting, and computer monitors. The source that raises the most concern is the computer monitor.

The general population is aware of the health effects of computer use such as eyestrain and headaches. Yet, there is a possible health risk from exposure to electromagnetic fields released by the computer monitor. These fields are emitted all around them with most magnetic radiation released from the back and sides of the monitor. There is great exposure to this EMF because the working population spends a lot of time at their desk with the computer on.

There are no known products to prevent exposure to this EMF and the U. S. has set no standards for magnetic fields from computer monitors. The Swedish government, which is usually in the forefront of magnetic field regulation, has established a manufacturing standard of no more than 2.5 mG at 20 inches. The Swedish government standard has become the standard in the computer monitor industry worldwide.

The federally permitted limit of magnetic fields in the U.S. workplaces is 1000 mG. "The workplace limit is based on the faulty assumption that only thermal, or heat, effects are important as a potential biological hazard."

Common Sources of Magnetic Fields at Work

Source	6"	1'	2'	4'
Copy Machine				
Lowest	4	2	1	-
Highest	200	40	13	4
Fax Machine				
Lowest	4	1	-	-
Highest	9	200	-	-
Fluorescent Light				
Lowest	20	-	-	-
Highest	100	30	8	4
Computer Monitor				
Lowest	7	2	2	-
Highest	20	6	6	-

Radio Frequency and Microwave EMFs

The advancement of technology has allowed society to benefit from the use of radio, TV, and cellular phones. Due to the rapid growth of technology, we're practically surrounded by antennas, towers, and microwave dishes. The negative impact of all of this technological advancement is suffered by the environment due to the increasing amount of electromagnetic radiation pollution in the air.

The term "RF" is normally used to represent both Radio frequency (RF) and Microwave (MW) radiation; microwaves are at the high end of the RF band. Sources of RF radiation are AM and FM transmissions, TV (VHF and UHF), CB radios, cordless phones, cellular or mobile phones, microwave communications technology, microwave ovens, air traffic control and weather radars, and satellite communication earth stations.

The closer you are to an antenna, the higher is your potential exposure. Society is continually exposed to a combination of ambient RF fields from a variety of antennas. According to the EPA, the highest public RF exposures occur near the base station of broadcast towers and in high-rise buildings in line-of-sight with the powerful broadcast beams.

Although experts on both sides of the health effects issue agree that more research needs to be conducted, years of studies have reported dangerous RF EMF effects such as chromosomal damage, increased tumor growth, immune system disorders, and birth defects.

There is a potential for billions in profits in the RF technology industry as companies maximize their opportunities that help them capture a competitive advantage. Yet, as society becomes more informed about the possible health effects of RF technology, the communications industry, and especially the cellular phone industry, is at a risk of lost profits and lawsuits.

Safety Regulation - The Federal Communications Commission (FCC) is required by the National Environmental Policy Act (NEPA) of 1969 to evaluate the effects of emissions from communication facilities and transmitting stations on the environment. In 1996, the FCC adopted the National Counsel on Radiation Protection (NCRP) recommended Maximum Permissible Exposure Limits for transmitters operating at frequencies of 300 KHz to 100 GHz. See figure below for some technologies, in this range that the FCC safety limit applies to.

Cellular Phones - There are currently 600 million cellular phone users and the number is expected to increase to 800 million by the year 2005. With the tremendous growth of cell phone use, numerous reports have been issued regarding their potential health hazards. These range from headaches, noise in the ears, and stress to scarier reports of memory loss, DNA damage and cancer.

Cell phones have been referred to as "the biggest domestic appliance source of radiation ever invented." This is the first time in human existence that people have wandered around with radiating devices held close to their body. Cell phones operate in the Ultra High Frequency (UHF) in the microwave band, which are maximally absorbed by human tissue. Some researchers think that a worse frequency could not have been chosen for the emerging technology regarding the human body. Cell phones emit EMF from the entire surface of the phone. These waves penetrate user's brains. (The human brain is somewhat protected by a thick skull comprised of calcium except for the ear canal.)

Although there is not conclusive evidence that RF EMF is harmful, in 1998, cellular phone manufacturers applied for patents to reduce the level of microwave emissions and develop new equipment designed to minimize the health risks associated with using the cell phone. This can be seen as an admission that cell phones pose a health risk and lawyers claim that the admission will pave the way for civil suits against manufacturers.

Most recently, in 1999, a study conducted by Wireless Technology Research (WTR) and funded by the Cellular Telecommunications Industry Association (CTIA) showed a correlation between a higher evidence of brain cancer, greater risk of neurological tumors, and DNA damage amongst cell phone users versus users of other types of phones. (WTR is an organization that was established in 1993 to address health risks from wireless communications technology and is funded by the CTIA.) Despite these findings, CTIA maintains that cellular phones are safe and meet the standards adopted by the U.S. government. There reasons being that these findings were just a few among a far greater number of studies showing no effects.

Every cell phone sold in the U.S. has a SAR rating which measures how much microwave energy can penetrate the brain. However, according to an ABC TV's 20/20 news report, government safety standards are vague because certain phones pass the FCC safety requirement when held in one position and failed when in another. Scientists

have found that up to 70% of cell phone EMF is absorbed by and actually penetrates the brain.

Government and industry should implement fund more research and implement more precautionary public health standards. For example, in Switzerland, the government recently approved precautionary rules for cell phone exposure. The restrictions set limits for cell phone power level emissions that are substantially lower than US standards.

A Letter Bomb for the Mobile Phone Industry

To understand some of the serious legal implications for mobile phone manufactures, which have claimed that there is no evidence for adverse health effects from mobile phone use, lets read the following letter. This letter was written by **Dr. George Carlo**, head of Wireless Technology Research (WTR) to the CEO of American Telephone & Telegraph (AT&T). WTR, headed by George Carlo, was founded by the U.S. Cellular Telecommunications Industry Association (CTIA) in 1993, to research the possibility of brain tumors, and any other health issues being related to mobile phone use.

7 October 1999
Mr. C. Michael Armstrong
Chairman and Chief Executive Officer
AT & T Corporation
32 Avenue of the Americas New York, New York 100313-2412

Dear Mr Armstrong:
After much thought, I am writing this letter to you, personally, to ask your assistance in solving what I believe is an emerging and serious problem concerning wireless phones. I write this letter in the interest of the more than 80 million wireless phone users in the United States and the more than 200 million worldwide. But I also write this letter in the interest of your industry, a critical part of our social and economic infrastructure. Since 1993, I have headed the WTR surveillance and research program funded by the wireless industry. The goal of WTR has always been to identify and solve any problems concerning consumers' health that could arise from the use of these phones. This past February, at the annual convention of the CTIA, I met with the full board of that organization to brief them on some surprising findings from our work. I do not recall if you were there personally, but my understanding is that all segments of the industry were represented. At that briefing, I explained that the well-conducted scientific studies that WTR was overseeing indicated that the question of wireless phone safety had become confused. Specifically, I reported to you that:

- *The rate of death from brain cancer among handheld phone users was higher than the rate of brain cancer death among those who used non-handheld phones that were away from their head;*
- *The risk of acoustic neuroma, a benign tumour of the auditory nerve that is well in range of the radiation coming from a phone's antenna, was fifty percent higher in people who reported using cell phones for six years or more, moreover, that relationship between the amount of cell phone use and this tumour appeared to follow a dose-response curve;*
- *The risk of rare neuro epithelial tumours on the outside of the brain was more than doubled, a statistically significant risk increase, in cell phone users as compared to people who did not use cell phones;*
- *There appeared to be some correlation between brain tumors occurring on the right side of the head and the use of the phone on the right side of the head;*
- *Laboratory studies looking at the ability of radiation from a phone's antenna to cause functional genetic damage were definitively positive, and were following a dose- response relationship. I also indicated that while our overall study of brain cancer occurrence did not show a correlation with cell phone use, the vast majority of the tumors that were studied, were well out of range of the radiation that one would expect from a cell phone's antenna. Because of that distance, the finding of no effect was questionable. Such mis-classification of radiation exposure would tend to dilute any real effect that may have been present. In addition, I reported to you that the genetic damage studies we conducted to look at the ability of radiation from the phones to break DNA were negative, but that the positive finding of functional DNA damage*

could be more important, perhaps indicating a problem that is not dependent on DNA breakage, and that these inconsistencies needed to be clarified. I reported that while none of these findings alone were evidence of a definitive health hazard from wireless phones, the pattern of potential health effects evidenced by different types of studies, from different laboratories, and by different investigators raised serious questions.

Following my presentation, I heard by voice vote of those present, a pledge to "do the right thing in following up these findings" and a commitment of the necessary funds. When I took on the responsibility of doing this work for you, I pledged five years. I was asked to continue on through the end of a sixth year, and agreed. My tenure is now completed. My presentation to you and the CTIA board in February was not an effort to lengthen my tenure at WTR, nor to lengthen the tenure of WTR itself. I was simply doing my job of letting you know what we found and what needed to be done following from our findings. I made this expressly clear during my presentation to you and in many subsequent conversation with members of your industry and the media. Today, I sit here extremely frustrated and concerned that appropriate steps have not been taken by the wireless industry to protect consumers during this time of uncertainty about safety. The steps I am referring to specifically followed from the WTR program and have been recommended repeatedly in public and private for and by me and other experts from around the world. As I prepare to move away from the wireless phone issue and into a different public health direction. I am concerned that the wireless industry is missing a valuable opportunity by dealing with these public health concerns through politics, creating illusions that more research over the next several years helps consumers today, and false claims that regulatory compliance means safety. The better choice by the wireless industry would be to implement measured steps aimed at true consumer protection. Alarmingly, indications are that some segments of the industry have ignored the scientific findings suggesting potential health effects, have repeatedly and falsely claimed that wireless phones are safe for all consumers including children, and have created an illusion of responsible follow up by calling for and supporting more research. The most important measures of consumer protection are missing: complete and honest factual information to allow informed judgment by consumers about assumption of risk; the direct tracking and monitoring of what happens to consumers who use wireless phones; and, the monitoring of changes in the technology that could impact health. I am especially concerned about what appear to be actions by a segment of the industry to conscript the FCC, the FDA and The World Health Organization with them in following a non-effectual course that will likely result in a regulatory and consumer backlash. As an industry, you will have to deal with the fallout from all of your choices, good and bad, in the long term. But short term, I would like your help in effectuating an important public health intervention today. The question of wireless phone safety is unclear. Therefore, from a public health perspective, it is critical for consumers to have the information they need to make an informed judgment about how much of this unknown risk they wish to assume in their use of wireless phones. Informing consumers openly and honestly about what is known and not-known about health risks is not liability laden - it is evidence that your industry is being responsible, and doing all it can to assure safe use of its products. The current popular backlash we are witnessing in the United States today against the tobacco industry is derived in large part from perceived dishonesty on the part of that industry in not being forthright about health effects. I urge you to help your industry not repeat that mistake. As we close out the business of the WTR, I would like to openly ask for your help in distributing the summary findings we have complied of our work. This last action is what always has been anticipated and forecast in the WTR's research agenda. I have asked another organization with which I am affiliated, The Health Risk Management Group (HRMG) , to help us with this public health intervention step, and to put together a consumer information package for widespread distribution. Because neither WTR nor HRMG have the means to effectuate this intervention, I am asking you to help us do the right thing.

I would be happy to talk to you personally about this.
Sincerely yours
[Signed]
George L. Carlo Ph.D., M. S., JD
Chairman
Wireless Technology Research LLC
1711 N. Street, NW, Suite 400, Washington DC 20036-2811
(202) 785 3939 telephone (202) 785-3940 facsimile

Conclusions

I. EMF is a hazard so adeptly defined as the "Fourth Pollution":

- It exists and the technologies that emanate EMF are not going to go away any time soon, the entrepreneurial enterprise will quickly see the potential business opportunities in the EMF pollution control, education, mitigation and innovation area and find a focus for both services and products all meriting sound strategy and management of technological innovation.
- The FCC exposure limits are 1 mw/cm2 for public exposure and 5 mw/cm2 for workers. (Mw/cm2 is the unit used to measure the intensity of RF EMFs.) The FCC also adopted the Specific Absorption Rate (SAR) limits for devices operating close to the body such as cellular phones. SAR is a measure of the amount of energy absorbed by the body in an RF field. The SAR limit is 1.6 watts/kg as measured over 1 gram of tissue.
- The FCC guidelines are based only on the thermal effects of RF energy and do not address non-thermal effects.

II. EMF from Wireless Phones and other appliances can affect the ***BRAIN*** and may cause:

- Headaches and Migraine
- Irritability, Tinnitus and Vertigo
- Chronic Fatigue Syndrome
- Fibromyalgia
- Ménière's Disease
- Seizures and Epilepsy
- Autism, Rett Syndrome and other Brain developmental diseases in children
- Brain Tumors, specially Acoustic Neuromas
- DNA Mutations that cause Birth Defects in the fetus (if the pregnant woman is exposed)

What are you reading this for?

DO SOMETHING!

Protect Yourself!