



American Academy of Environmental Medicine

Electromagnetic and Radiofrequency Fields Effect on Human Health

For over 50 years, the American Academy of Environmental Medicine (AAEM) has been studying and treating the effects of the environment on human health. In the last 20 years, our physicians began seeing patients who reported that electric power lines, televisions and other electrical devices caused a wide variety of symptoms. By the mid 1990's, it became clear that patients were adversely affected by electromagnetic fields and becoming more electrically sensitive. In the last five years with the advent of wireless devices, there has been a massive increase in radiofrequency (RF) exposure from wireless devices as well as reports of hypersensitivity and diseases related to electromagnetic field and RF exposure. Multiple studies correlate RF exposure with diseases such as cancer, neurological disease, reproductive disorders, immune dysfunction, and electromagnetic hypersensitivity.

The electromagnetic wave spectrum is divided into ionizing radiation such as ultraviolet and X-rays and non-ionizing radiation such as radiofrequency (RF), which includes WiFi, cell phones, and Smart Meter wireless communication. It has long been recognized that ionizing radiation can have a negative impact on health. However, the effects of non-ionizing radiation on human health recently have been seen. Discussions and research of non-ionizing radiation effects centers around thermal and non-thermal effects. According to the FCC and other regulatory agencies, only thermal effects are relevant regarding health implications and consequently, exposure limits are based on thermal effects only.¹

While it was practical to regulate thermal bioeffects, it was also stated that non-thermal effects are not well understood and no conclusive scientific evidence points to non-thermal based negative health effects.¹ Further arguments are made with respect to RF exposure from WiFi, cell towers and smart meters that due to distance, exposure to these wavelengths are negligible.² However, many *in vitro*, *in vivo* and epidemiological studies demonstrate that significant harmful biological effects occur from non-thermal RF exposure and satisfy Hill's criteria of causality.³ Genetic damage, reproductive defects, cancer, neurological degeneration and nervous system dysfunction, immune system

dysfunction, cognitive effects, protein and peptide damage, kidney damage, and developmental effects have all been reported in the peer-reviewed scientific literature.

Genotoxic effects from RF exposure, including studies of non-thermal levels of exposure, consistently and specifically show chromosomal instability, altered gene expression, gene mutations, DNA fragmentation and DNA structural breaks.⁴⁻¹¹ A statistically significant dose response effect was demonstrated by Maschevich *et al.*, who reported a linear increase in aneuploidy as a function of the Specific Absorption Rate(SAR) of RF exposure.¹¹ Genotoxic effects are documented to occur in neurons, blood lymphocytes, sperm, red blood cells, epithelial cells, hematopoietic tissue, lung cells and bone marrow. Adverse developmental effects due to non-thermal RF exposure have been shown with decreased litter size in mice from RF exposure well below safety standards.¹² The World Health Organization has classified RF emissions as a group 2 B carcinogen.¹³ Cellular telephone use in rural areas was also shown to be associated with an increased risk for malignant brain tumors.¹⁴

The fact that RF exposure causes neurological damage has been documented repeatedly. Increased blood-brain barrier permeability and oxidative damage, which are associated with brain cancer and neurodegenerative diseases, have been found.^{4,7,15-17} Nittby *et al.* demonstrated a statistically significant dose-response effect between non-thermal RF exposure and occurrence of albumin leak across the blood-brain barrier.¹⁵ Changes associated with degenerative neurological diseases such as Alzheimer's, Parkinson's and Amyotrophic Lateral Sclerosis (ALS) have been reported.^{4,10} Other neurological and cognitive disorders such as headaches, dizziness, tremors, decreased memory and attention, autonomic nervous system dysfunction, decreased reaction times, sleep disturbances and visual disruption have been reported to be statistically significant in multiple epidemiological studies with RF exposure occurring non-locally.¹⁸⁻²¹

Nephrotoxic effects from RF exposure also have been reported. A dose response effect was observed by Ingole and Ghosh in which RF exposure resulted in mild to extensive degenerative changes in chick embryo kidneys based on duration of RF exposure.²⁴ RF emissions have also been shown to cause isomeric changes in amino acids that can result in nephrotoxicity as well as hepatotoxicity.²⁵

Electromagnetic field (EMF) hypersensitivity has been documented in controlled and double blind studies with exposure to various EMF frequencies. Rea *et al.* demonstrated that under double blind placebo controlled conditions, 100% of subjects showed reproducible reactions to that frequency

to which they were most sensitive.²² Pulsed electromagnetic frequencies were shown to consistently provoke neurological symptoms in a blinded subject while exposure to continuous frequencies did not.²³

Although these studies clearly show causality and disprove the claim that health effects from RF exposure are uncertain, there is another mechanism that proves electromagnetic frequencies, including radiofrequencies, can negatively impact human health. Government agencies and industry set safety standards based on the narrow scope of Newtonian or “classical” physics reasoning that the effects of atoms and molecules are confined in space and time. This model supports the theory that a mechanical force acts on a physical object and thus, long-range exposure to EMF and RF cannot have an impact on health if no significant heating occurs. However, this is an incomplete model. A quantum physics model is necessary to fully understand and appreciate how and why EMF and RF fields are harmful to humans.^{26,27} In quantum physics and quantum field theory, matter can behave as a particle or as a wave with wave-like properties. Matter and electromagnetic fields encompass quantum fields that fluctuate in space and time. These interactions can have long-range effects which cannot be shielded, are non-linear and by their quantum nature have uncertainty. Living systems, including the human body, interact with the magnetic vector potential component of an electromagnetic field such as the field near a toroidal coil.^{26,28,29} The magnetic vector potential is the coupling pathway between biological systems and electromagnetic fields.^{26,27} Once a patient’s specific threshold of intensity has been exceeded, it is the frequency which triggers the patient’s reactions.

Long range EMF or RF forces can act over large distances setting a biological system oscillating in phase with the frequency of the electromagnetic field so it adapts with consequences to other body systems. This also may produce an electromagnetic frequency imprint into the living system that can be long lasting.^{26,27,30} Research using objective instrumentation has shown that even passive resonant circuits can imprint a frequency into water and biological systems.³¹ These quantum electrodynamic effects do exist and may explain the adverse health effects seen with EMF and RF exposure. These EMF and RF quantum field effects have not been adequately studied and are not fully understood regarding human health.

Because of the well documented studies showing adverse effects on health and the not fully understood quantum field effect, AAEM calls for exercising precaution with regard to EMF, RF and general frequency exposure. In an era when all society relies on the benefits of electronics, we must find ideas and technologies that do not disturb bodily function. It is clear that the human body uses electricity from the chemical bond to the nerve impulse and obviously this orderly sequence can be

disturbed by an individual-specific electromagnetic frequency environment. Neighbors and whole communities are already exercising precaution, demanding abstention from wireless in their homes and businesses.

Furthermore, the AAEM asks for:

- An immediate caution on Smart Meter installation due to potentially harmful RF exposure.
- Accommodation for health considerations regarding EMF and RF exposure, including exposure to wireless Smart Meter technology.
- Independent studies to further understand the health effects from EMF and RF exposure.
- Recognition that electromagnetic hypersensitivity is a growing problem worldwide.
- Understanding and control of this electrical environmental bombardment for the protection of society.
- Consideration and independent research regarding the quantum effects of EMF and RF on human health.
- Use of safer technology, including for Smart Meters, such as hard-wiring, fiber optics or other non-harmful methods of data transmission.

Submitted by: Amy L. Dean, DO, William J. Rea, MD, Cyril W. Smith, PhD, Alvis L. Barrier, MD

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American Academy of Pediatrics

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July 12, 2012

The Honorable Julius Genachowski
Commissioner
Federal Communications Commission
445 12th Street SW
Washington, DC 20554

Dear Chairman Genachowski:

The American Academy of Pediatrics (AAP), a non-profit professional organization of 60,000 primary care pediatricians, pediatric medical subspecialists, and pediatric surgical specialists dedicated to the health, safety and well-being of infants, children, adolescents, and young adults strongly supports the proposal for a formal inquiry into radiation standards for cell phones and other wireless products. The Academy encourages the Federal Communications Commission (FCC) to vote to move forward with this inquiry in an expeditious manner.

The FCC has not assessed the standard for cell phone radiation since 1996. According to industry groups, approximately 44 million people had mobile phones when the standard was set; today, there are more than 300 million mobile phones in use in the United States. While the prevalence of wireless phones and other devices has sky-rocketed, the behaviors around cell phone uses have changed as well. The number of mobile phone calls per day, the length of each cell phone call, and the amount of time people use mobile phones has increased, while cell phone and wireless technology has undergone substantial changes. Many more people, especially adolescents and young adults, now use cell phones as their only phone line and they begin using wireless phones at much younger ages.

The FCC standard for maximum radiation-exposure levels are based on the heat emitted by mobile phones. These guidelines specify exposure limits for hand-held wireless devices in terms of the Specific Absorption Rate (SAR), which measures the rate the body absorbs radiofrequency (RF). The current allowable SAR limit is 1.6 watts per kilogram (W/kg), as averaged over one gram of tissue. Although wireless devices sold in the United States must ensure that they do not exceed the maximum allowable SAR limit when operating at the device's highest possible power level, concerns have been raised that long-term RF exposure at this level affects the brain and other tissues and may be connected to types of brain cancer, including glioma and meningioma.

In the past few years, a number of American and international health and scientific bodies have contributed to the debate over cell phone radiation and its possible link to cancer. The International Agency for Research on Cancer (IARC), part of the

United Nations' World Health Organization, said in June 2011 that a family of frequencies that includes mobile-phone emissions is "possibly carcinogenic to humans." The National Cancer Institute has stated that although studies have not demonstrated that RF energy from cell phones definitively causes cancer, more research is needed because cell phone technology and cell phone use are changing rapidly. While a definitive link between cell phone radiation and brain cancer has not been established, these studies and others clearly demonstrate the need for further research into this area and highlight the importance of reassessing the current SAR to determine if it is protective of human health.

The AAP believes the inquiry to reassess the radiation standard presents an opportunity to review its impacts on children's health and well-being. In the past, such standards have generally been based on the impact of exposure on an adult male. Children, however, are not little adults and are disproportionately impacted by all environmental exposures, including cell phone radiation. In fact, according to IARC, when used by children, the average RF energy deposition is two times higher in the brain and 10 times higher in the bone marrow of the skull, compared with mobile phone use by adults. While the Academy appreciates that the FCC is considering investigating whether the emission standards should be different for devices primarily used by children, it is essential that any new standard for cell phones or other wireless devices be based on protecting the youngest and most vulnerable populations to ensure they are safeguarded throughout their lifetimes.

Finally, in reviewing the SAR standard, the FCC has the opportunity to highlight the importance of limiting media use among children. The Academy has found potentially negative effects and no known positive effects of media use by children under the age of two, including television, computers, cell phones, and other handheld wireless devices. In addition, studies consistently show that older children and adolescents utilize media at incredibly high rates, which potentially contributes to obesity and other health and developmental risks. In reviewing the SAR limit, the FCC has the opportunity to improve the health of our nation by highlighting the importance of limiting screen time and media use for children and adolescents.

The AAP supports the proposal for a formal inquiry into radiation standards for cell phones and other wireless products and the Academy encourages the FCC to vote in favor of moving forward with this investigation. If you have questions or concerns, please contact Kristen Mizzi in the AAP's Washington Office at 202/347-8600.

Sincerely,

A handwritten signature in dark ink, appearing to read "R. Block", written in a cursive style.

Robert W. Block, MD FAAP
President

RWB/km



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The American Academy of Environmental Medicine Statement on WiFi in Schools

Adverse health effects, such as learning disabilities, altered immune responses, headaches, ect. from wireless radio frequency fields do exist and are well documented in the scientific literature. Safer technology, such as using hard-wiring, must be seriously considered in schools for the safety of those susceptible individuals who may be affected by this phenomenon.

Approved by the American Academy of Environmental Medicine Board of Directors on June 9, 2012.



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May 2, 2012

**Re: Open Letter to Parents, Teachers, School Boards.
Regarding Wi-Fi Networks in Schools**

This is an update of an open letter I wrote May 5, 2009 (the original letter follows the updated information).

Much has happened during the past 3 years regarding our understanding of the health effects associated with microwave radiation¹.

New Developments Regarding Radio Frequency Radiation and Health since 2009

1. On May 31st, 2011, the World Health Organization classified radio frequency electromagnetic fields as a possible human carcinogen. Although this does not sound harmful, as it is just "possible" and not "probable," it is never-the-less a warning that we may be playing with fire by exposing students and their teachers (some of whom may be pregnant) to microwave radiation generated by Wi-Fi routers in the classroom. Health authorities, like Health Canada, have tried to downplay this new classification and wrongly assumed that it applied only to cell phones. It applies to ALL forms of radio frequency radiation as stated by Dr. Jonathan Samet (University of California) in this short video. <http://www.youtube.com/watch?v=s4E2i5XFX9M> See also: <http://www.magdahavas.com/iarc-declares-rf-from-cell-phones-and-cell-towers-dangerous/>

Radio frequency is generated by Wi-Fi routers, cell phones, mobile phones, wireless baby monitors, wireless games and toys that are remote controlled, smart meters, some home security systems, and antennas that support cell phone, broadcast radio and television as well as radar.

2. Also in May 2011, The Parliamentary Assembly Council of Europe (PACE) released Resolution 1815 on the Potential Dangers of Electromagnetic Fields and their Effect on the Environment. Here is the link to the Resolution <http://assembly.coe.int/Mainf.asp?link=/Documents/AdoptedText/tall/ERES1815.htm>

This is what they had to say about Wi-Fi in schools.

¹ [Wi-Fi uses microwave radiation (also referred as radio frequency radiation) at two different frequencies 2.4 and 5.8 GHz. The 2.4 GHz is similar to that used in a microwave oven.]

8.3.2. *for children in general, and particularly in schools and classrooms, give preference to wired Internet connections, and strictly regulate the use of mobile phones by schoolchildren on school premises;*

3. A subcommittee of the **WHO held a meeting in Geneva on May 13, 2011** to discuss multiple chemical sensitivity and electrohypersensitivity (EHS) and placing these two illnesses on the WHO's International Classification of Diseases (ICD).

Electrohypersensitivity, refers to an adverse physiological reaction experienced by some individuals when they are exposed to electromagnetic fields and/or radiation. Symptoms include chronic pain, chronic fatigue, difficulty sleeping, cognitive dysfunction, mood disorders, dizziness, nausea, tinnitus, skin disorders etc. EHS is not yet officially recognized in Canada although physicians and some medical centres are diagnosing and treating patients with this illness.

4. **The International Electromagnetic Field Alliance (IEMFA)**—consisting of an international group of scientists—released the **Seletun Statement (Norway) 2010**, which states the following:

The Scientific Panel recognizes that the body of evidence on EMF requires a new approach to protection of public health; the growth and development of the fetus, and of children; and argues for strong preventative actions. New, biologically-based public exposure standards are urgently needed to protect public health worldwide. <http://www.magdahavas.com/international-experts'-perspective-on-the-health-effects-of-electromagnetic-fields-emf-and-electromagnetic-radiation-emr/>

5. **The American Academy of Environmental Medicine** (2012) recently requested a moratorium on smart meters in their position paper on "Electromagnetic and Radiofrequency Fields Effect on Human Health." I would contend that the radiation from Wi-Fi in schools is as high, if not higher than the radiation generated by smart meters. If a moratorium on smart meters is requested that should also apply to deployment of Wi-Fi in schools.

6. **The Austrian Medical Association**, on March 3, 2012, released their guide for diagnosing and treating people who have electrosensitivity. The more we exposed populations to electrosmog the more people are going to become sensitive to this radiation. One of the main recommendations is the reduction of EMF exposure.

7. **The Ontario English Catholic Teacher's Association (OECTA)** prepared a position paper February 2012 regarding the use of WiFi in the workplace. This document is available at <http://www.magdahavas.com/ontario-english-catholic-teachers-association-wi-fi-in-the-workplace/> It is an excellent document that all school boards should take seriously.

How many scientific and medical warnings do we need before we begin to practice good electromagnetic hygiene? What if those who believe this radiation is safe . . . are wrong? Who will take responsibility for the increase in neurological disorders and cancers that may develop as well as reproductive problems (microwave radiation affects sperm)? Is the convenience of wireless more important than the health of students and teachers? Most people do not want to live near cell phone towers but they are willing to put similar microwave transmitters inside a school environment?

Wired connects (Ethernet or fibre optics) are the best solution and many schools that are now installing Wi-Fi already have Ethernet ports for internet access.

For those who want more information. I prepared a 25-minute video on Wi-Fi in schools. Please watch it and then decide if the convenience is worth the risk. <http://www.youtube.com/watch?v=6v75sKAUFdc>

Magda Havas, BSc., Ph.D., May 2, 2012.

Original Open Letter dated: May 5, 2009.

I am a scientist who does research on the health effects of electromagnetic radiation and I am becoming increasingly concerned that a growing number of schools are installing WiFi networks and are making their school grounds available for cell phone antennas.

You will be told by both the federal government (Health Canada and Industry Canada) as well as by the Wi-Fi provider that this technology is **safe** provided that exposures to radio frequency radiation remain below federal guidelines.

You should know that the guidelines we have in Canada protect the public against heating but NOT against biological effects. We have some of the worst guidelines in the world for radio frequency radiation.

This information is **outdated** and **incorrect** based on the growing number of scientific publications that are reporting adverse health and biological effects below our Safety Code 6 guidelines (see www.bioinitiative.org) and the growing number of scientific and medical organizations that are asking for stricter guidelines to be enforced.

For these reasons it is irresponsible to introduce Wi-Fi microwave radiation into a school environment where young children spend hours each day.

FACT:

1. GUIDELINES: Guidelines for microwave radiation (which is what is used in Wi-Fi) range 5 orders of magnitude in countries around the world. The lowest guidelines are in Salzburg Austria and now in

Liechtenstein. The guideline in these countries is 0.1 microW/cm². See short video (<http://videos.nextup.org/SfTv/Liechtenstein/AdoptsTheStandardOf06VmBioInitiative/09112008.html>). In

Switzerland the guideline is 1 and in Canada it is 1000 microW/cm² !

Why does Canada have guidelines that are so much higher than other countries? Canada's guidelines are based on a short-term (6-minute) heating effect. It is assumed that if this radiation does not heat your tissue it is "safe". This is not correct. Effects are documented at levels well below those that are able to heat body tissue. See attached report: *Analysis of Health and Environmental Effects of Proposed San Francisco Earthlink Wi-Fi Network* (2007). These biological effects include increased permeability of the blood brain barrier, increased calcium flux, increase in cancer and DNA breaks, induced stress proteins, and nerve damage. Exposure to this energy is associated with altered white blood cells in school children; childhood leukemia; impaired motor function, reaction time, and memory; headaches, dizziness, fatigue, weakness, and insomnia.

2. ELECTRO-HYPER-SENSITIVITY: A growing population is adversely affected by these electromagnetic frequencies. The illness is referred to as "electro-hyper-sensitivity" (EHS) and is recognized as a disability in Sweden. The World Health Organization defines EHS as:

"... a phenomenon where individuals experience adverse health effects while using or being in the vicinity of devices emanating electric, magnetic, or electromagnetic fields (EMFs). . . EHS is a real and sometimes a debilitating problem for the affected persons, while the level of EMF in their neighborhood is no greater than is encountered in normal living environments. Their exposures are generally several orders of magnitude under the limits in internationally accepted standards."

Health Canada acknowledges in their Safety Code 6 guideline that some people are more sensitive to this form of energy but they have yet to address this by revising their guidelines.

Symptoms of EHS include sleep disturbance, fatigue, pain, nausea, skin disorders, problems with eyes and ears (tinnitus), dizziness, etc. It is estimated that 3% of the population are severely affected and another 35% have moderate symptoms. Prolonged exposure may be related to sensitivity and for this reason it is

imperative that children's exposure to microwave radiation (Wi-Fi and mobile phones) be minimized as much as possible.

3. CHILDREN'S SENSITIVITY: Children are more sensitive to environmental contaminants and that includes microwave radiation. The Stewart Report (2000) recommended that children not use cell phones except for emergencies. The cell phone exposes your head to microwave radiation. A wireless computer (Wi-Fi) exposes your entire upper body and if you have the computer on your lap it exposes your reproductive organs as well. Certainly this is not desirable, especially for younger children and teenagers. For this reason we need to discourage the use of wireless technology by children, especially in elementary schools. That does not mean that students cannot go on the Internet. It simply means that access to the Internet needs to be through wires rather than through the air (wireless, Wi-Fi).

4. REMOVAL OF WI-FI: Most people do not want to live near either cell phone antennas or Wi-Fi antennas because of health concerns. Yet when Wi-Fi (wireless routers) are used inside buildings it is similar to the antenna being inside the building rather than outside and is potentially much worse with respect to exposure since you are closer to the source of emission.

Libraries in France are removing Wi-Fi because of concern from both the scientific community and their employees and patrons.

The Vancouver School Board (VSB) passed a resolution in January 2005 that prohibits construction of cellular antennas within 1000 feet (305 m) from school property.

Palm Beach, Florida, Los Angeles, California, and New Zealand have all prohibited cell phone base stations and antennas near schools due to safety concerns. The decision not to place cell antennas near schools is based on the likelihood that children are more susceptible to this form of radiation. **Clearly if we do not want antennas "near" schools, we certainly do not want antennas "inside" schools!** The safest route is to have wired internet access rather than wireless. While this is the more costly alternative in the short-term it is the least costly alternative in the long run if we factor in the cost of ill health of both teachers and students.

5. ADVISORIES: Advisories to limit cell phone use have been issued by the various countries and organizations including the UK (2000), Germany (2007), France, Russia, India, Belgium (2008) as well as the Toronto Board of Health (July 2008) and the Pittsburgh Cancer Institute (July 2008). While these advisories relate to cell phone use, they apply to Wi-Fi exposure as well since both use microwave radiation. If anything, Wi-Fi computers expose more of the body to this radiation than do cell phones.

6. PRECAUTIONARY PRINCIPLE: Even those who do not "accept" the science showing adverse biological effects of microwave exposure should recognize the need to be careful with the health of children. For this reason we have the Precautionary Principle, which states:

In order to protect the environment, the precautionary approach shall be widely applied by States according to their capability. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost effective measures to prevent environmental degradation.

In this case "States" refers to the School Board and those who make decisions about the health of children.

The two most important environments in a child's life are the home (especially the bedroom) and the school. For this reason it is imperative that these environments remain as safe as possible. **If we are to err, please let us err on the side of caution.**

Respectfully submitted, Dr. Magda Havas, Associate Professor Trent University May 5, 2009

Expressions of Concern from Scientists, Physicians, Health Policy Experts & Others

William Rea, MD

**Founder & Director of the Environmental Health Center, Dallas
Past President, American Academy of Environmental Medicine**

“Sensitivity to electromagnetic radiation is the emerging health problem of the 21st century. It is imperative health practitioners, governments, schools and parents learn more about it. The human health stakes are significant”.

Martin Blank, PhD

**Associate Professor, Department of Physiology and Cellular Biophysics,
Columbia University, College of Physicians and Surgeons; Researcher in Bioelectromagnetics;
Author of the BioInitiative Report’s section on Stress Proteins.**

“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 power lines, cell phones and the like, or risk the known consequences. The science is very strong and we should sit up and pay attention.”

Olle Johansson, Ph.D.

Associate Professor, The Experimental Dermatology Unit, Department of Neuroscience, Karolinska Institute, Stockholm, Sweden; Author of the BioInitiative Report’s section on the Immune System.

“It is evident that various biological alterations, including immune system modulation, are present in electrohypersensitive persons. There must be an end to the pervasive nonchalance, indifference and lack of heartfelt respect for the plight of these persons. It is clear something serious has happened and is happening. Every aspect of electrohypersensitive peoples’ lives, including the ability to work productively in society, have healthy relations and find safe, permanent housing, is at stake. The basics of life are becoming increasingly inaccessible to a growing percentage of the world’s population. I strongly advise all governments to take the issue of electromagnetic health hazards

seriously and to take action while there is still time. There is too great a risk that the ever increasing RF-based communications technologies represent a real danger to humans, especially because of their exponential, ongoing and unchecked growth. Governments should act decisively to protect public health by changing the exposure standards to be biologically-based, communicating the results of the independent science on this topic and aggressively researching links with a multitude of associated medical conditions.”

David Carpenter, MD

**Professor, Environmental Health Sciences, and Director, Institute for Health and the Environment,
School of Public Health, University of Albany, SUNY
Co-Editor, The BioInitiative Report (www.BioInitiative.org)**

Electromagnetic fields are packets of energy that does not have any mass, and visible light is what we know best. X-rays are also electromagnetic fields, but they are more energetic than visible light. Our concern is for those electromagnetic fields that are less energetic than visible light, including those that are associated with electricity and those used for communications and in microwave ovens. The fields associated with electricity are commonly called “extremely low frequency” fields (ELF), while those used in communication and microwave ovens are called “radiofrequency” (RF) fields. Studies of people have shown that both ELF and RF exposures result in an increased risk of cancer, and that this occurs at intensities that are too low to cause tissue heating. Unfortunately, all of our exposure standards are based on the false assumption that there are no hazardous effects at intensities that do not cause tissue heating. Based on the existing science, many public health experts believe it is possible we will face an epidemic of cancers in the future resulting from uncontrolled use of cell phones and increased population exposure to WiFi and other wireless devices. Thus it is important that all of us, and especially children, restrict our use of cell phones, limit exposure to background levels of Wi-Fi, and that government and industry discover ways in which to allow use of wireless devices without such elevated risk of serious disease. We need to educate decision-makers that ‘business as usual’ is unacceptable. The importance of this public health issue can not be underestimated.”

Magda Havas, PhD

**Associate Professor, Environment & Resource Studies, Trent University, Canada.
Expert in radiofrequency radiation, electromagnetic fields, dirty electricity and ground current.**

“Radio frequency radiation and other forms of electromagnetic pollution are harmful at orders of magnitude well below existing guidelines. Science is one of the tools society uses to decide health policy. In the case of telecommunications equipment, such as cell phones, wireless networks, cell phone antennas, PDAs, and portable phones, the science is being ignored. Current guidelines urgently need to be re-examined by government and reduced to reflect the state of the science. There is an emerging public health crisis at hand and time is of the essence.”

Whitney North Seymour, Jr., Esq.

**Retired Attorney; Former New York State Senator & United States Attorney, Southern District of NY
Co-Founder, Natural Resources Defense Council**

“Electromagnetic radiation is a very serious human and environmental health issue that needs immediate attention by Congress. The BioInitiative Report is a major milestone in understanding the health risks from wireless technology. Every responsible elected official owes it to his or her constituents to learn and act on its finding and policy recommendations.”

B. Blake Levitt

Former New York Times journalist and author of *Electromagnetic Fields, A Consumer's Guide to the Issues and How to Protect Ourselves*, and Editor of *Cell Towers, Wireless Convenience? Or Environmental Hazard?*

Ambient man-made electromagnetic fields (EMFs), across a range of frequencies, are a serious environmental issue. Yet most environmentalists know little about it, perhaps because the subject has been the purview of physicists and engineers for so long that biologists have lost touch with electromagnetism's fundamental inclusion in the biological paradigm. All living cells and indeed whole living beings, no matter what genus or species, are dynamic coherent electrical systems utterly reliant on bioelectricity for life's most basic metabolic processes. It turns out that most living things are fantastically sensitive to vanishingly small EMF exposures. Living cells interpret such exposures as part of our normal cellular activities (think heartbeats, brainwaves, cell division itself, etc.) The problem is, man-made electromagnetic exposures aren't "normal." They are artificial artifacts, with unusual intensities, signaling characteristics, pulsing patterns, and wave forms, that don't exist in nature. And they can misdirect cells in myriad ways. Every aspect of the ecosystem may be affected, including all living species from animals, humans, plants and even microorganisms in water and soil. We are already seeing problems in sentinel species like birds, bats, and bees. Wildlife is known to abandon areas when cell towers are placed. Radiofrequency radiation (RF)—the part of the electromagnetic spectrum used in all-things-wireless today—is a known immune system suppressor, among other things. RF is a form of energetic air pollution and we need to understand it as such. Humans are not the only species being affected. The health of our planet may be in jeopardy from this newest environmental concern—added to all the others. Citizens need to call upon government to fund appropriate research and to get industry influence out of the dialogue. We ignore this at our own peril now.”

Eric Braverman, MD

Brain researcher, Author of *The Edge Effect*, and Director of Path Medical in New York City and The PATH Foundation. Expert in the brain's global impact on illness and health.

“There is no question EMFs have a major effect on neurological functioning. They slow our brain waves and affect our long-term mental clarity. We should minimize exposures as much as possible to optimize neurotransmitter levels and prevent deterioration of health”.

Abraham R. Liboff, PhD

Research Professor
Center for Molecular Biology and Biotechnology
Florida Atlantic University, Boca Raton, Florida
Co-Editor, Electromagnetic Biology and Medicine

“The key point about electromagnetic pollution that the public has to realize is that it is not necessary that the intensity be large for a biological interaction to occur. There is now considerable evidence that extremely weak signals can have physiological consequences. These interactive intensities are about 1000 times smaller than the threshold values formerly estimated by otherwise knowledgeable theoreticians, who, in their vainglorious approach to science, rejected all evidence to the contrary as inconsistent with their magnificent calculations. These faulty estimated thresholds are yet to be corrected by both regulators and the media.

The overall problem with environmental electromagnetism is much deeper, not only of concern at power line frequencies, but also in the radiofrequency range encompassing mobile phones. Here the public’s continuing exposure to electromagnetic radiation is largely connected to money. Indeed the tens of billions of dollars in sales one finds in the cell phone industry makes it mandatory to corporate leaders that they deny, in knee-jerk fashion, any indication of hazard.

There may be hope for the future in knowing that weakly intense electromagnetic interactions can be used for good as well as harm. The fact that such fields are biologically effective also implies the likelihood of medical applications, something that is now taking place. As this happens, I think it will make us more aware about how our bodies react to electromagnetism, and it should become even clearer to everyone concerned that there is reason to be very, very careful about ambient electromagnetic fields.”

Lennart Hardell, MD, PhD

Professor at University Hospital, Orebro, Sweden.

World-renowned expert on cell phones, cordless phones, brain tumors, and the safety of wireless radiofrequency and microwave radiation.

Co-authored the BioInitiative Report’s section on Brain Tumors by Dr. Hardell

“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. 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.”

Samuel Milham MD, MPH

Medical epidemiologist in occupational epidemiology.

First scientist to report increased leukemia and other cancers in electrical workers and to demonstrate that the childhood age peak in leukemia emerged in conjunction with the spread of residential electrification.

“Very recently, new research is suggesting that nearly all the human plagues which emerged in the twentieth century, like common acute lymphoblastic leukemia in children, female breast cancer, malignant melanoma and asthma, can be tied to some facet of our use of electricity. There is an urgent need for governments and individuals to take steps to minimize community and personal EMF exposures.”

Libby Kelley, MA

Managing Secretariat International Commission For Electromagnetic Safety; Founder, Council on Wireless Technology Impacts; Co-Producer of documentary, “Public Exposure: DNA, Democracy and the Wireless Revolution”; EMF environmental consultant and leading appellant in challenging the FCC Radio Frequency Radiation human exposure guidelines, 1997-2000. (www.icems.eu)

“Radiofrequency radiation human exposure standards for personal wireless communications devices and for environmental exposure to wireless transmitters are set by national governments to guide the use of wireless communications devices and for wireless transmitters. In the U.S., the Food and Drug Administration and the Federal Communications Commission set these standards. The Council on Wireless Technology Impacts considers these exposure standards to be inadequate as they are based on heating effects and do not accommodate the low level, cumulative exposure conditions in which the public now lives. These standards are also designed for acute, short term exposure conditions and do not acknowledge the medical evidence pointing to increased risks and actual harm that results from chronic, intermittent exposure. Federal and State public health agencies are not officially addressing what many concerned scientists and medical doctors now see as an emerging public health problem. There are no health surveillance or remedial response systems in place to advise citizens about electromagnetic radiation exposure (EMR). As wireless technology evolves, ambient background levels increase, creating electrical pollution conditions which are becoming ubiquitous and more invasive. We strongly encourage consumers, manufacturers, utility providers and policymakers to reduce, eliminate and mitigate EMR exposure conditions and to support biologically based standards.”

James S. Turner, Esq.

Chairman of the Board, Citizens for Health

Co-author, *Voice of the People: The Transpartisan Imperative in American Life*

Attorney, Swankin-Turner, Washington, DC

“According to the *BioInitiative Report: A Rationale for a Biologically-Based Public Exposure Standard for Electromagnetic Fields*—from electrical and electronic appliances, power lines and wireless devices such as cell phones, cordless phones, cellular antennas, towers, and broadcast transmission towers—we live in an invisible fog of EMF which thirty years of science, including over 2,000 peer reviewed studies, shows exposes us to serious health risks such as increased Alzheimer’s disease, breast cancer, Lou Gehrig disease, EMF immune system hypersensitivity and

disruption of brain function and DNA. The public needs to wake up politicians and public officials to the need for updating the decades old EMF public health standards. This report tells how.”

Camilla Rees, MBA

CEO, Wide Angle Health, LLC

Patient education and advocacy

“The U.S. spends over \$2 trillion dollars on health care each year, of which about 78% is from people with chronic illnesses, without adequately exploring and understanding what factors—including EMF/RF—contribute to imbalances in peoples’ bodies’ in the first place. After reading The BioInitiative Report, it should come as no surprise to policymakers, given the continually increasing levels of EMF/RF exposures in our environment, that close to 50% of Americans now live with a chronic illness. I grieve for people who needlessly suffer these illnesses and hold out the hope that our government leaders will become more cognizant of the role electromagnetic factors are playing in disease, health care costs and the erosion of quality of life and productivity in America.”

L. Lloyd Morgan, BS Electronic Engineering

Director Central Brain Tumor Registry of the United States, Member Bioelectromagnetics Society, Member Brain Tumor Epidemiological Consortium *

“There is every indication that cell phones cause brain tumors, salivary gland tumors and eye cancer. Yet, because the cell phone industry provides a substantial proportion of research funding, this reality is hidden from the general public. The Interphone Study, a 13-country research project, substantially funded by the cell phone industry has consistently shown that use of a cell phone protects the user from risk of a brain tumor! Does anything more need to be said? It is time that fully independent studies be funded by those governmental agencies whose charter is to protect its citizens so that the truth about the very damaging health hazards of microwave radiation becomes clear and well known.”

**For identification purposes only: All statements are mine and mine alone and do not represent positions or opinions of the Central Brain Tumor Registry of the United States, the Bioelectromagnetics Society or the Brain Tumor Epidemiological Consortia.*

Janet Newton

President, The EMR Policy Institute

www.EMRPolicy.org

“The radiofrequency radiation safety policy in force in the United States fails to protect the public. Currently in the US there are more than 260 million wireless subscribers, the demand that drives the continuing build-out of antenna sites in residential and commercial neighborhoods, including near

schools, daycare centers, and senior living centers and in the workplace. The January 2008 report issued by the National Academy of Sciences committee whose task was to examine the needs and gaps in the research on the biological effects of exposure to these antennas points out that the research studies to date do not adequately represent exposure realities. Specifically, the studies 1) assume a single antenna rather than the typical arrangements of a minimum of four to six antennas per site, thereby underestimating exposure intensities, 2) do not pertain to the commonly used multiple-element base station antennas, thereby not taking into account exposures to multiple frequencies, 3) lack models of several heights for men, women, and children of various ages for use in the characterization of Specific Absorption Rate (SAR) distributions for exposures from cell phones, wireless PCs, and base stations and 4) do not take into consideration absorption effects of exposures from the many different radio frequency emitting devices to which the public is often simultaneously exposed. A federal research strategy to address these very serious inadequacies in the science on which our government is basing health policy is sorely needed now.”

Prof. Livio Giuliani, PhD

Spokesperson, International Commission for Electromagnetic Safety (www.icems.eu)

Deputy Director, Italian National Institute for Worker Protection and Safety, East Venice and South Tyrol; Professor, School of Biochemistry of Camerino University, Italy

The Venice Resolution, initiated by the International Commission for Electromagnetic Safety (ICEMS) on June 6, 2008, and now signed by nearly 50 peer reviewed scientists worldwide, states in part, “We are compelled to confirm the existence of non-thermal effects of electromagnetic fields on living matter, which seem to occur at every level of investigation from molecular to epidemiological. Recent epidemiological evidence is stronger than before. We recognize the growing public health problem known as electrohypersensitivity. We strongly advise limited use of cell phones, and other similar devices, by young children and teenagers, and we call upon governments to apply the Precautionary Principle as an interim measure while more biologically relevant exposure standards are developed.”

Professor Jacqueline McGlade

Executive Director, European Environmental Agency

Advisor to European Union countries under the European Commission

“There are many examples of the failure to use the precautionary principle in the past, which have resulted in serious and often irreversible damage to health and environments. Appropriate, precautionary and proportionate actions taken now to avoid plausible and potentially serious threats to health from EMF are likely to be seen as prudent and wise from future perspectives.”

Paul J. Rosch, MD

Clinical Professor of Medicine and Psychiatry, New York Medical College; Honorary Vice President International Stress Management Association; Diplomat, National Board of Medical Examiners; Full Member, Russian Academy of Medical Sciences; Fellow, The Royal Society of Medicine;

Emeritus Member, The Bioelectromagnetics Society

Claims that cell phones pose no health hazards are supported solely by Specific Absorption Rate (SAR) limits safety standards written by the telecommunications industry decades ago based on studies they funded. These have made the erroneous assumption that the only harm that could come from cell phone radiofrequency emissions would be from a thermal or heating action, since such non thermal fields can have no biological effects. The late Dr. Ross Adey disproved this three decades ago by demonstrating that very similar radiofrequency fields with certain carrier and modulation frequencies that had insufficient energy to produce any heating could cause the release of calcium ions from cells. Since then, numerous research reports have confirmed that non thermal fields from cell phones, tower transmitters, power lines, and other man made sources can significantly affect various tissues and physiologic functions.

We are constantly being bathed in an increasing sea of radiation from exposure to the above, as well as electrical appliances, computers, Bluetooth devices, Wi-Fi installations and over 2,000 communications satellites in outer space that shower us with signals to GPS receivers. New WiMax transmitters on cell phone towers that have a range of up to two square miles compared to Wi-Fi's 300 feet will soon turn the core of North America into one huge electromagnetic hot spot. Children are more severely affected because their brains are developing and their skulls are thinner. A two-minute call can alter brain function in a child for an hour, which is why other countries ban their sale or discourage their use under the age of 18. In contrast, this is the segment of the population now being targeted here in a \$2 billion U.S. advertising campaign that views "tweens" (children between 8 and 12 years old) as the next big cell phone market. Firefly and Barbie cell phones are also being promoted for 6 to 8-year-olds.

It is not generally appreciated that there is a cumulative effect and that talking on a cell phone for just an hour a day for ten years can add up to 10,000 watts of radiation. That's ten times more than from putting your head in a microwave oven. Pregnant women may also be at increased risk based on a study showing that children born to mothers who used a cell phone just two or three times a day during pregnancy showed a dramatic increase in hyperactivity and other behavioral and emotional problems. And for the 30% of children who had also used a cell phone by age 7, the incidence of behavioral problems was 80% higher! Whether ontogeny (embryonic development) recapitulates phylogeny is debatable, but it is clear that lower forms of life are also much more sensitive. If you put the positive electrode of a 1.5 volt battery in the Pacific Ocean at San Francisco and the negative one off San Diego, sharks in the in between these cities can detect the few billionths of a volt electrical field. EMF fields have also been implicated in the recent massive but mysterious disappearance of honeybee colonies essential for pollinating over 90 commercial crops. As Albert Einstein warned, "If the bee disappeared off the surface of the globe, then man would only have four years of life left."

Finally, all life on earth evolved under the influence of solar radiation and geomagnetic forces that

we have learned to adapt to and in some instances even utilize. The health of all living systems (ranging upward from a cell, tissue, organ or person, to a family, organization or nation) depends on good communication – good communication within, as well as with the external environment. All communication in the body eventually takes place via very subtle electromagnetic signaling between cells that is now being disrupted by artificial electropollution we have not had time to adapt to. As Alvin Toffler emphasized in *Future Shock*, too much change in too short a time produces severe stress due to adaptational failure. The adverse effects of electrosmog may take decades to be appreciated, although some, like carcinogenicity, are already starting to surface. This gigantic experiment on our children and grandchildren could result in massive damage to mind and body with the potential to produce a disaster of unprecedented proportions, unless proper precautions are immediately implemented. At the same time, we must acknowledge that novel electromagnetic therapies have been shown to benefit stress related disorders ranging from anxiety, depression and insomnia, to arthritis, migraine and tension headaches. As demonstrated in *Bioelectromagnetic Medicine*, they may also be much safer and more effective than drugs, so we need to avoid throwing the baby out with the bathwater.”

Working for Safe Technologies for Nurseries, Schools and Colleges

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International Concerns

Resolutions, Recommendations and Statements of Concern

The following organisations, groups and individuals have expressed their concerns about potential adverse health effects for the public, especially children, from the repeated use of wireless technologies.

The International Commission for Electromagnetic Safety (ICEMS)

See also 'Precautionary Approach'. ICEMS, in their Benevento Resolution (2006) and Venice Resolution (June 2008), have stated their concern for the effects of human exposure to electromagnetic fields on health. Made up of scientists, medical doctors and engineers from around the world, ICEMS *'are compelled to confirm the existence of non-thermal effects of electromagnetic fields on living matter, which seem to occur at every level of investigation from molecular to epidemiological.'* *'We, who are at the forefront of this research, encourage an ethical approach in setting of exposure standards which protect the health of all, including those who are more vulnerable.'* *'... new standards should be developed to take various physiological conditions into consideration, e.g., pregnancy, newborns, children, and elderly people.'*

'We take exception to the claim of the wireless communication industry that there is no credible scientific evidence to conclude there is a risk. Recent epidemiological evidence is stronger than before, which is a further reason to justify precautions be taken to lower exposure standards in accordance with the Precautionary Principle. We recognize the growing public health problem known as electrohypersensitivity; that this adverse health condition can be quite disabling; and, that this condition requires further urgent investigation and recognition.'

'We strongly advise limited use of cell phones, and other similar devices, by young children and teenagers, and we call upon governments to apply the Precautionary Principle as an interim measure while more biologically relevant standards are developed to protect against, not only the absorption of electromagnetic energy by the head, but also adverse effects of the signals on biochemistry, physiology and electrical biorhythms.'

ICEMS have produced a series of four videos for teenagers which describe how

mobile phones can be used more safely and what the potential risks are (January 2010).

European Parliament and European Environment Agency

More information in 'Precautionary Approach'. The European Parliament Committee on the Environment, Public Health and Food Safety (2008) has stated that it is greatly concerned at the International Bio-Initiative report (2007) concerning electromagnetic fields. In September 2007 the European Environment Agency (EEA) advised the 27 member states on the basis of the Bio-Initiative report that they should introduce more effective protection of the general public from electromagnetic fields. In April 2009 the European Parliament called for increased funding for further studies into health effects of long-term exposure to electromagnetic fields (see Precautionary Approach). In September 2009 the Director of the EEA stated that the evidence for potential risks is strong enough to justify steps to reduce people's exposure to radio frequency electromagnetic fields and that the current exposure limits needed to be reconsidered.

Bio-Initiative Report

See also Precautionary Approach and Bio-Initiative Report sections. Briefly, the International Bio-Initiative report (2007), referred to by the European Parliament, has stated that *'There may be no lower limit at which exposures do not affect us. Until we know whether 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'*.

*ELF and RF. ELF, extremely low frequency electromagnetic fields from electrical and electronic devices and power lines. RF, radio frequency radiation from wireless devices such as cell phones and cordless phones, cellular antennas and towers and broadcast transmission towers.

'The consequence of long-term exposures in children whose nervous system continues 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, judgement, memory, learning, and control over behaviour'.

'... we 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.'

French Parliament

Members of the French Senate presented a bill to restrict exposure to electromagnetic fields (April 2009; in French; partial English translation). It included:

Article 14 The Wi-Fi function of all Wi-Fi-equipped devices is deactivated by default. Instruction booklets contain clear and visible information about the health risks of using Wi-Fi and preventative measures to take when it is activated.

Article 15 Where possible, in public buildings wired connections will be obligatory for all new communications networks, except in special circumstances which are in the public interest. Where possible, existing Wi-Fi installations will be replaced by wired networks within 5 years of the promulgation of the present law.

Article 16 WiMax roll-out is suspended for 5 years from the promulgation of the

present law and will be replaced by wired broadband.

In October 2009 the French Health and Security Agency recommended that people reduce their exposure to mobile phones and other wireless devices. "The time for inaction is past" said the Director, Martin Guespereau. Exposure to children should in particular be limited and Wi-Fi transmitters switched off whenever possible.

For French Schools, see further down the page.

Teachers' Unions

Voice

Philip Parkin, the General Secretary of the Education Professionals Union, Voice, formerly the Professional Association of Teachers, UK, has called for a full investigation into the networks. *'We continue to be concerned about the possible effects of Wi-Fi. Particularly on children whose brains and bodies are still developing'* he said (2007). Voice is calling for a moratorium on new Wi-Fi networks in schools and the suspension of existing Wi-Fi if possible.

The proliferation of wireless networks could be having serious implications for the health of some staff and pupils without the cause being recognised. There are huge commercial pressures which may be why there has not yet been any significant action. Speaking about the announcement of an investigation into Wi-Fi by the Health Protection Agency (measuring emissions from computers in schools to check whether they are within ICNIRP guidelines), Mr Parkin states, *'Whilst we welcome this investigation I do not feel that it goes far enough. It seems to be concentrating on what should be known already rather than on what is not known. It seems to me that the HPA:*

- has pre-judged outcomes before they have done the work;*
- seems to only be considering the thermal effect of EMR (electromagnetic radiation) and not the potential long-term health risks associated with the non-thermal effects;*
- is assessing against the totally inadequate ICNIRPS guidelines which only relate to the thermal effects of EMR;*
- does not appear to be doing any health-related investigations amongst children; and*
- appears to be concentrating on measuring radiation levels which are already known, or should have been before the technology was allowed to be used in schools.'*

In December 2008, Philip Parkin described his continuing concern about the potential effects on children of Wi-Fi in school, in the article 'A ticking time bomb?'

'It is a considerable concern that in schools we are installing Wi-Fi systems and we have no clear evidence that they are safe' says Philip Parkin in an interview, May 2009. When asked whether the Government has fully grasped the potential long-term consequences of Wi-Fi in schools, Mr Parkin replied *'No the government has not. The government is avoiding the issue... we have to be absolutely sure that it is safe. This is something the government has not been prepared to grasp.'*

Association of Teachers and Lecturers (ATL)

Mark Langhammer, Director of the education union ATL Northern Ireland, UK, has said *'A safety-first approach would oblige governors and education employers to monitor and report on Wi-Fi provision in schools. It could allow for parents to withdraw their children from Wi-Fi areas of the school and it would oblige*

government to test and measure, based on biological, as well as thermal criterion' (Belfast Telegraph, 30/10/2008).

Members of the ATL have called for a major investigation to be carried out by the Government into the biological effects of Wi-Fi networks (9/4/2009). The Union has argued that these should not be used until it has been proven that they do not cause a threat to children's health. ATL member Colin Kinney proposed the motion at the Union's annual conference. He raised concerns that pupils could be risking cancer or sterility due to the installation of these networks. *'Should we force our pupils to use it without long-term safety studies being carried out? I don't believe we should,'* he stated. The ATL agreed to lobby the Government to carry out a full investigation into the effects of Wi-Fi (Daily Mail, 8/4/2009).

GEW

The German teachers' Union for Education and Knowledge (GEW, Gewerkschaft Erziehung und Wissenschaft) has told its members to resist the rollout of Wi-Fi into schools in Germany on safety grounds. The GEW Union in Hesse has proposed *'Due to possible effects on school performance, a healthy school should not only be smoke free, but also allow teachers and students to teach and study in a radiation free environment'* (2007).

Ontario Catholic Teachers Association

The Ontario English Catholic Teachers Association recognizes that the installation of Wi-Fi microwave transmitters and the expanded use of wireless devices in Catholic schools and educational facilities may present a potential Health and Safety risk or hazard in the workplace. Association Website. 2012.

Austrian Medical Association and Public Health Department of Salzburg

The Public Health Department of Salzburg (2005) has warned that Wi-Fi should not be put in schools or nurseries. The Austrian Medical Association is lobbying against the deployment of Wi-Fi in schools.

Schools in Germany

The Bavarian Parliament has recommended that no schools in the province use wireless LAN networks. The Frankfurt City Government said that it would not install Wi-Fi in its schools until it had been shown to be harmless.

The German Federal Government has recommended that the use of WLAN in the workplace or home should be avoided, if possible. They have stated that conventional wired connections are preferred (July 2007).

Schools in the UK

Several schools in the UK have removed their Wi-Fi systems because parents were concerned about adverse health effects (TimesOnline, Nov 20th, 2006; Ulster Star, 28th Aug 2008; BBC News, 25th Sept 2009). Parents in some schools are refusing to let their children use the wireless computers, and are campaigning to have alternative wired-up computing facilities available (Liverpool Daily Post 21st Oct 2009; BBC Radio Merseyside 1.15pm 21st Oct 2009; Gazettelive 15th Oct 2009).

Schools and Universities in France

The city of Hérouville St. Clair in France has agreed that by the end of the school year, all Wi-Fi equipment will be removed from primary schools. An information campaign will also be conducted with residents to raise awareness of the risks associated with mobile telephony (27th April 2009, and further information). September 2010 update on Wi-Fi in schools in Hérouville St. Clair (and translation).

The Health and Safety Committee for Paris III Sorbonne University has announced that it is stopping the use of Wi-Fi on its premises (May 2009).

Libraries in Paris

The Bibliotheque Nationale de France has forgone installation of a public Wi-Fi system, and decided to follow the precautionary principle following concerns raised in the Bio-Initiative Report (2007). Wi-Fi has also been switched off in the Sainte Genevieve Library in Paris after a member of Staff complained of adverse health effects from the wireless network.

Lakehead University, Ontario, Canada

Lakehead University in Ontario, Canada has limited its use of Wi-Fi based on the precautionary principle, due to health concerns. It has comprehensive fibre-optic computer network throughout the campus, 9000 plug-in sites, internet cafes and computer laboratories. The University state that they have taken this approach because there are numerous scientific studies that demonstrate a basis for concern that continuous or frequent long-term exposure to the non-ionizing radiation of electromagnetic fields could have adverse health effects. Its statement (November 2009) on the use of Wi-Fi includes: *'There will be no use of Wi-Fi in those areas of the University already served by hard wire connectivity until such time as the potential health effects have been scientifically rebutted or there are adequate protective measures that can be taken.'* *'Cellular communications antennae will not be placed on University property'* (2009).

The Progressive Librarian's Guild

The Progressive Librarian's Guild in America (2008) recommend *'that via their professional organizations, information workers address the risks of wireless technology in public spaces, take steps in learning about the risks of wireless in terms of exposure and impact on library services, monitor wireless technology in their facilities, critically evaluate and adopt alternatives to wireless technology especially in children's sections of libraries, create warning signage on risks of wi-fi throughout their libraries, and act as a community resource in the public education on wireless technologies.'*

Individual Scientists

Professor Dennis Henshaw, Professor of human radiation effects at Bristol University has called for an enquiry into the dangers of Wi-Fi wireless internet technology (2007). *'The research hasn't been done. Therefore we cannot assume that there are no effects'* he told the Independent Newspaper. *'This technology is being wheeled out without any checks and balances'*.

Dr Johansson at the Department of Neuroscience at the Karolinska Institute in Stockholm has sent a letter advising against the use of Wi-Fi to Swedish School Governors (Powerwatch, 2005). Videos from Dr Johansson about wireless technologies, Wake Up Call 1 and Wake Up Call 2 (2010).

Dr Havas from the Department of Environmental and Resource Studies, Trent University, Canada, has written two open letters to schools recommending that they do not use Wi-Fi (May 2009, January 2010). Dr Havas has also sent an open letter to the Chief Medical Officers in Canada requesting that they make a public announcement about the potentially harmful effects of Wi-Fi radiation in the school environment (September 2010). Face to Face interview with Dr Magda Havas.

Ian Gibson, former MP and chairman of the Commons Science and Technology Committee and honorary Professor and former Dean of the School of Biological Sciences at the University of East Anglia, said *'We need a departmental enquiry into*

this situation. The Department of Health should be looking into it seriously' (The TimesOnline, Nov 25th, 2006).

David Carpenter, MD, Director of the Institute for Health and the Environment, School of Public Health, University of Albany, New York, has said 'Based on the existing science, many public health experts believe it is possible we will face an epidemic of cancers in the future resulting from uncontrolled use of cell phones and increased population exposure to Wi-Fi and other wireless devices. Thus it is important that all of us, and especially children, restrict our use of cell phones, limit exposure to background levels of Wi-Fi, and that government and industry discover ways in which to allow use of wireless devices without such elevated risk of serious disease. We need to educate decision-makers that 'business as usual' is unacceptable. The importance of this public health issue can not be underestimated'.

Further quotes from scientists, physicians and health policy experts can be found on ElectromagneticHealth.org, along with audio interviews.

The Stewart Report, UK

The Stewart Report (2000, see also Precautionary Approach) commissioned by the UK Government stated that a precautionary approach should be taken to the use of mobile phone technologies until more detailed information on any health effects becomes available. It recommended that the beam of greatest intensity from mobile phone masts should not fall on any part of a school's grounds or buildings without the agreement of the school and parents. The Stewart Report also advises that children should not use mobile phones for non-essential calls.

Information on Wi-Fi

EMFacts consultancy have a fact sheet on Wi-Fi (2008, file here).

An article on Wi-Fi from the Ecologist, 2008.

Further articles and links about Wi-Fi are listed on the Voice website.

Mobile phones

UK Chief Medical Officers

UK Chief Medical Officers recommend that if parents wish their children to avoid being subject to possible risks, they should not let their children (under the age of 16) use mobile phones (Department of Health Website, 2006). However, some schools are now buying mobile phones for their pupils to use (BECTA).

The Russian National Committee on Non-Ionising Radiation Protection (RNCNIRP)

The RNCNIRP have announced their concern about the high risks to children's health from the use of mobile phones and wireless communication systems (2008, Radiation Research Trust). In a statement by the Chairman, Professor Yury Grigoriev, the RNCNIRP say *The members of the Russian National Committee on Non-Ionizing Radiation Protection emphasize ultimate urgency to defend children's health from the influence of the EMF (electromagnetic fields) of the mobile communication systems. We appeal to the government authorities, to the entire society to pay closest attention to this coming threat and to take adequate measures in order to prevent negative consequences to the future generation's health. The children using mobile communication are not able to realize that they subject their brain to the EMF radiation and their health - to the risk. We believe that this risk is not much lower than the risk to the children's health from tobacco or alcohol. It is our professional obligation not to let damage the children's health by inactivity'. It is worth reading the whole statement made by*

the RNCNIRP (here).

Russia recommends that mobile phones are not used by children under the age of 18. Russia also recommends that pregnant women do not use mobile phones.

The RCNIRP are calling on the international scientific community to study the risks to children from the use of mobile communication systems and to research the effects of chronic low intensity radiofrequency electromagnetic fields on the developing brain (March, 2009).

French Government

The French Government has warned that children should limit their use of wireless phones (2002) and is introducing legislation to ban advertising of mobile phones to children (2009). The French Senate voted to ban mobile phones in schools because of health concerns (October 2009).

Finland

The Radiation and Nuclear Safety Authority (STUK) in Finland has recommended restricting the use of mobile phones by children (2009).

Israel

The Israeli Ministry of Health has called for children's use of mobile phones to be limited (2008).

Israeli Parliament has backed a bill requiring a health warning on all mobile phones: "Warning - the Health Ministry cautions that heavy use and carrying the device next to the body may increase the risk of cancer, especially among children." March 2012.

India

The Indian Ministry of Telecommunication has recommended that children under the age of 16 should be discouraged from using cell phones (2008).

Tajikistan

Tajikistan has banned mobile phones in all schools and universities in a bid to boost education (March 2009). Those who carry a mobile phone will be fined.

Interphone Study into the possible link between mobile phone use and cancer

The co-ordinator of the International Interphone study, Elisabeth Cardis, recommends, as far as children are concerned, that mobile phones should not be used beyond reasonable limits and that landlines should be preferred.

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Guideline of the Austrian Medical Association (ÖÄK) for the diagnosis and treatment of EMF-related health problems and illnesses (EMF syndrome)

Consensus paper of the Austrian Medical Association's EMF Working Group (ÖÄK AG-EMF)

Adopted at the meeting of environmental medicine officers of the Regional Medical Association's and the Austrian Medical Association on 3rd March 2012 in Vienna.

Introduction

There has been a sharp rise in unspecific, often stress-associated health problems that increasingly present physicians with the challenge of complex differential diagnosis. A cause that has been accorded little attention so far is increasing electrosmog exposure at home, at work and during leisure activities, occurring in addition to chronic stress in personal and working life. It correlates with an overall situation of chronic stress that can lead to burnout.

How can physicians respond to this development?

The Austrian Medical Association has developed a guideline for differential diagnosis and potential treatment of unspecific stress-related health problems associated with electrosmog. Its core element is a patient questionnaire consisting of a general assessment of stress symptoms and a specific assessment of electrosmog exposure.

The guideline is intended as an aid in diagnosing and treating EMF-related health problems.

Background

Many people are increasingly exposed, to various degrees, to a combination of low and high frequency electric fields (EF), magnetic fields (MF) and electromagnetic fields (EMF) of different signal patterns, intensities and technical applications for varying periods of time, colloquially referred to as electrosmog.

Physicians are often confronted with unspecific complaints without clearly identifiable causes (Huss and Rösli 2006). It has been suspected that environmental conditions such as increasing exposure of the population to radio waves, emanating e.g. from cordless phones, mobile phone base stations, cell phones, GPRS, UMTS, data cards for laptop and notebook computers and wireless LAN (WLAN), but also exposure to electric and magnetic fields emanating from power lines, devices and equipment, may play a causal role (Blake Levitt and Lai 2010). For the medical profession, this raises new challenges in diagnosis and treatment. A central issue for

the causal attribution of symptoms is the assessment of variation in health problems depending on time and location, which is particularly relevant for environmental causes such as EMF exposure.

Austria is currently rolling out the fourth generation of mobile telephony (LTE), as well as smart metering (for electricity, gas and water consumption), resulting in additional EMF exposure of the population.

New radio technologies and applications have been introduced without certainty about their health effects, raising new challenges for medicine. For instance, the issues of so-called non-thermal effects and potential long-term effects of low-dose exposure were hardly investigated at all prior to introduction. Some patients suspect a link between EMF exposure and their health problems. Moreover, physicians are increasingly confronted with health problems with unidentified causes. Pursuing an evidence-based treatment strategy in this context is a challenge for differential diagnosis.

In Austria, there are no democratically legitimized limits to protect the general population from EMF exposure. The recommendations of the WHO, compiled by the International Commission on Non-Ionizing Radiation Protection (ICNIRP 1998), are based on a thermal model. These recommendations were adopted by the EU in its Council Recommendation of 1999 (EU-Ratsempfehlung 1999) and by Austria in its pre-standard ÖVE/ÖNORM E 8850:2006 02 01 (ÖNORM 2006) without taking into account long-term non-thermal effects.

In August 2007, the BioInitiative, an international group of experts, published a comprehensive report calling for preventive measures against EMF exposure based on the scientific evidence available (BioInitiative 2007). Consequently, the European Environment Agency compared electrosmog to other environmental hazards such as asbestos or benzene (EEA 2007).

In April 2009, a resolution of the European Parliament called for a review of the EMF limits in the EU Council Recommendation of 1999, which was based on the guidelines of the ICNIRP, with reference to the BioInitiative Report (EU Parliament 2009).

In May 2011, the Parliamentary Assembly of the Council of Europe adopted the report "The potential dangers of electromagnetic fields and their effect on the environment" (PACE 2011). The report calls for a number of measures to protect humans and the environment, especially from high-frequency electromagnetic fields. One of the recommendations is to "take all reasonable measures to reduce exposure to electromagnetic fields, especially to radio frequencies from mobile phones, and particularly the exposure to children and young people who seem to be most at risk from head tumours".

Also in May 2011, a group of experts at the International Agency for Research on Cancer, an agency of the WHO, classified radiofrequency electromagnetic fields as possibly carcinogenic (Group 2B) for humans (IARC 2011).

A representative telephone survey (n=2048, age >14 years) carried out in 2004 in Switzerland yielded a frequency of 5% (95% CI 4-6%) for a self-attributed "diagnosis" of electrosensitivity (Schreier et al. 2006).

In another survey carried out in Switzerland, in 2001, 394 respondents attributed specific health problems to EMF exposure. Among others, the following symptoms were reported as occurring frequently: sleep problems (58%), headaches (41%), nervousness (19%), fatigue (18%) and difficulty concentrating (16%). The respondents listed mobile phone base stations (74%), cell phones (36%), cordless phones (29%) and high-voltage lines (27%) as causes. Two thirds of respondents had taken measures to reduce their symptoms, the most frequent measure being to avoid exposure. Remarkably, only 13% had consulted their physicians (Röösli et al. 2004).

While a 2006 study by Regel et al. described no exposure effects, two provocation studies on exposure of "electrosensitive" individuals and control subjects to mobile phone base station signals (GSM, UMTS or both) found a significant decline in well-being after UMTS exposure in the individuals reporting sensitivity (Zwamborn et al. 2003, Eltiti et al. 2007). Analysis of the data available on exposure of people living near mobile phone base stations has yielded clear indications of adverse health effects (Santini et al. 2002, Navarro et al. 2003, Hutter et al. 2006, Abdel-Rassoul et al. 2007, Blettner et al. 2008).

Based on the scientific literature on interactions of EMF with biological systems, several mechanisms of interaction are possible. A plausible mechanism at the intracellular and intercellular level, for instance, is interaction via the formation of free radicals or oxidative and nitrosative stress (Friedmann et al. 2007, Simkó 2007, Pall 2007, Bedard and Krause 2007, Pacher et al. 2007, Desai et al. 2009). It centres on the increased formation of peroxynitrite (ONOO⁻) from a reaction of nitrogen monoxide (NO) with superoxide (O₂⁻). Due to its relatively long half-life, peroxynitrite damages a large number of essential metabolic processes and cell components.

This approach can serve as a plausible explanation of many of the health problems, symptoms and their progression observed in the context of EMF exposure. There are increasing indications that EMF syndrome (EMFS) should be counted among multi-system disorders (Pall 2007) such as Chronic Fatigue Syndrome (CFS), Multiple Chemical Sensitivity (MCS), fibromyalgia (FM) and Post Traumatic Stress Disorder (PTSD).

In Sweden, EMF syndrome is designated as electrohypersensitivity (EHS), considered a physical impairment and recognized as a disability. With reference to UN Resolution 48/96, Annex, of 20 December 1993 (UN 1993), local governments grant support to individuals with EHS. Employees with EHS have a right to support from their employers so as to enable them to work despite this impairment. Some hospitals in Sweden provide rooms with low EMF exposure.

The Austrian Medical Association considers it its duty and its mission to provide members of the medical profession with a compilation of the current state of the scientific and political debate from a medical perspective and with specific recommendations for action in this first guideline. The guideline can only be improved by suggestions, criticism and amendments. Due to the rapid development of various technologies, the recommendations need to be adapted on an ongoing basis. We therefore invite all medical professionals to send contributions to the next edition of the guideline to the following email address: post@aerztekammer.at

What to keep in mind when dealing with patients and EMF

In the case of unspecific health problems (see patient questionnaire) for which no clearly identifiable cause can be found, EMF exposure should in principle be taken into consideration as a potential cause, especially if the patient suspects that it may be the cause.

How to proceed if EMF-related health problems are suspected

The recommended approach to diagnosis and treatment is intended as an aid and should, of course, be modified as each individual case requires.

1. History of health problems and EMF exposure
2. Examination and findings
3. Measurement of EMF exposure
4. Prevention or reduction of EMF exposure
5. Diagnosis
6. Treatment