

Wi-Fi in Schools Nov 2011

Dr Andrew Goldsworthy

Most of the damage done by digital telecommunications is not due to heating but by the electrical effect their pulsating signals have on living tissues, which occurs at much lower energy levels.

The human body can act as an antenna and the signals make electric currents flow through it in time with the pulsations. It is this that does the bulk of the damage by destabilising the delicate membranes that surround each cell and also divide it into internal compartment such as mitochondria (the energy factories of the cell) and the lysosomes (the cell's recycling factories).

All of these membranes are just two molecules thick and have a similar basic structure. They are liquid crystals, made largely of negatively charged molecules (which repel one another) stabilised by divalent positive ions (mostly calcium) that sit in between them by mutual attraction and hold them together like mortar holds together the bricks in a wall.

It was first shown by Bawin *et. al.* in the 1970s that weak amplitude modulated radio waves, where the strength of the signal rises and falls at low frequencies, could remove some of this calcium from brain cell membranes. This destabilises them and make them more likely to leak. The low frequency pulsations of Wi-Fi and mobile phone signals can be expected to behave in much the same way.-

This is important in the brain because the normal function of brain cells depends on the controlled passage of specific ions through their membranes. When these membranes leak, ions flow through them in a relatively uncontrolled way, which results in brain hyperactivity and may cause attention deficit hyperactivity disorder (ADHD) in some people. When this occurs in the brain of a foetus or very young child it prevents normal brain development, which may result in autism (see <http://mcs-america.org/june2011pg2345.pdf>). Wi-Fi should therefore be considered as an impediment rather than an aid to learning and may be particularly hazardous for pregnant teachers.

Effects on the peripheral nervous system are equally damaging since hyperactivity here causes false sensations such as pain, heat, cold, and pins and needles in some people (i.e. symptoms of electromagnetic hypersensitivity). Hyperactivity in the cells of the inner ear can cause tinnitus and affect the sense of balance causing dizziness and symptoms of motion sickness, including nausea. Pupils showing any of these symptoms should be treated with sympathy and the Wi-Fi switched off.

Many other effects on health can be attributed to membrane leakage, including damage to DNA due to the release of reactive oxygen species (ROS) from mitochondria, and digestive enzymes from lysosomes. Such DNA damage can cause a loss of fertility and an increased risk of getting cancer.

Membrane leakage can also open the blood-brain barrier, leading to Alzheimer's disease and early dementia. There are similar barriers protecting all of our body surfaces from foreign chemicals. Damage to these can cause or exacerbate a variety of illnesses, including asthma, multiple allergies and autoimmune disorders such as multiple sclerosis. More on these, including references, can be found at http://www.hese-project.org/hese-uk/en/papers/cell_phone_and_cell.pdf

Fortunately, because of genetic variability, not everyone will suffer the same symptoms and many may suffer none at all but, for the sake of those that do suffer, Wi-Fi is not a good idea in schools or anywhere else for that matter.

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[Int J Neurosci.](#) 2011 Dec;121(12):670-6. Epub 2011 Sep 5.

Electromagnetic hypersensitivity: evidence for a novel neurological syndrome.

[McCarty DE](#), [Carrubba S](#), [Chesson AL](#), [Frilot C](#), [Gonzalez-Toledo E](#), [Marino AA](#).

Department of Neurology, LSU Health Sciences Center, Shreveport, Louisiana 71130-3932, USA.

Abstract

OBJECTIVE: We sought direct evidence that acute exposure to environmental-strength electromagnetic fields (EMFs) could induce somatic reactions (EMF hypersensitivity).

METHODS: The subject, a female physician self-diagnosed with EMF hypersensitivity, was exposed to an average (over the head) 60-Hz electric field of 300 V/m (comparable with typical environmental-strength EMFs) during controlled provocation and behavioral studies.

RESULTS: In a double-blinded EMF provocation procedure specifically designed to minimize unintentional sensory cues, the subject developed temporal pain, headache, muscle twitching, and skipped heartbeats within 100 s after initiation of EMF exposure ($p < .05$). The symptoms were caused primarily by field transitions (off-on, on-off) rather than the presence of the field, as assessed by comparing the frequency and severity of the effects of pulsed and continuous fields in relation to sham exposure. The subject had no conscious perception of the field as judged by her inability to report its presence more often than in the sham control.

DISCUSSION: The subject demonstrated statistically reliable somatic reactions in response to exposure to subliminal EMFs under conditions that reasonably excluded a causative role for psychological processes.

CONCLUSION: EMF hypersensitivity can occur as a bona fide environmentally inducible neurological syndrome.

PMID: 21793784 [PubMed - in process]

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Radiation from Cordless Phones Causes Heart Irregularities, According to New Research Published Today in the European Journal of Oncology

October 23, 2010. Boulder, CO. Cordless phones, which transmit a similar pulsed signal as Wi-Fi networks at 2.4 Gigahertz, have been shown to impact heart rate in new research published today in the *European Journal of Oncology*.

READ ABSTRACT

The double-blind, peer reviewed study validates the condition complained of by increasing numbers of people across the globe today called 'electrosensitivity', demonstrating immediate effects on heart rate, almost doubling the heart rate in some cases. The study, "Provocation Study using Heart Rate Variability Shows Radiation from 2.4 GHz Cordless Phone Affects Autonomic Nervous System" (Eur. J. Oncol. Library, vol. 5) was led by Prof. Magda Havas, PhD of the Environmental & Resources Studies Department at Trent University, Canada. Co-investigators included Jeffrey Marrongelle, Bernard Pollner, Elizabeth Kelley, Camilla R.G. Rees and Lisa Tully.

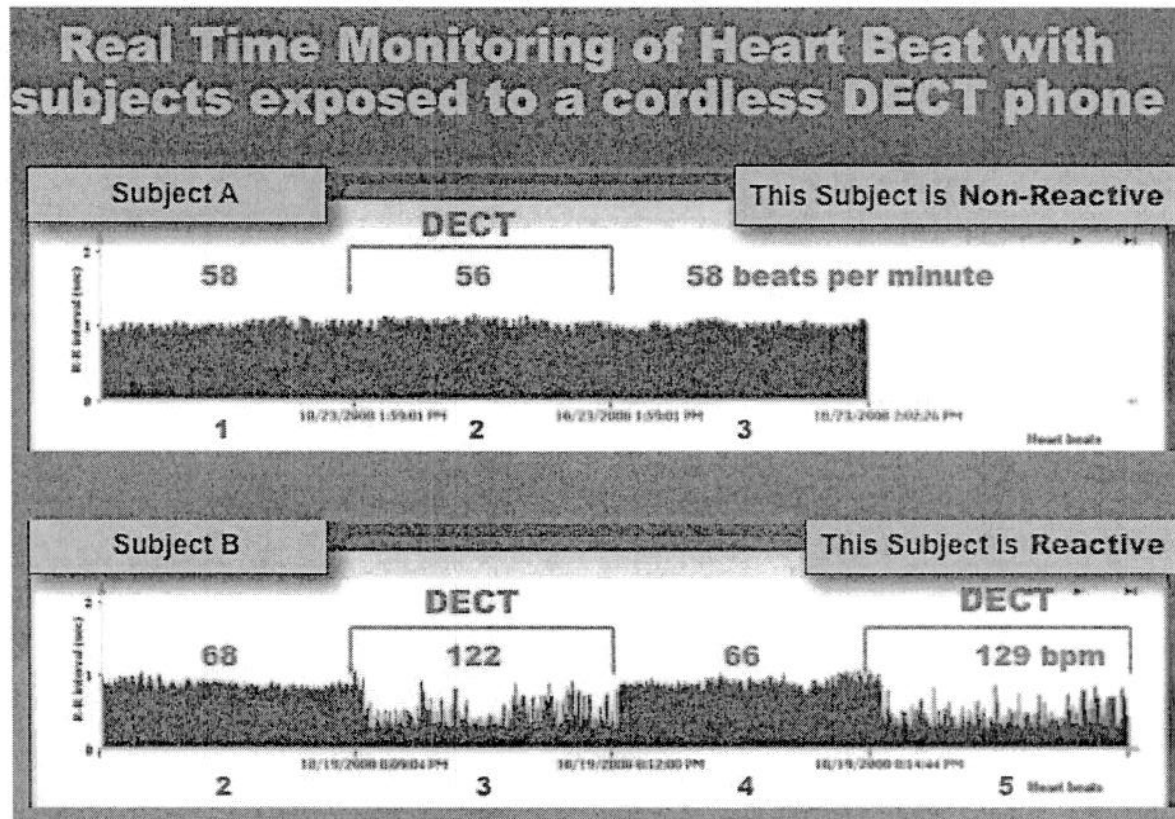
Patients today experiencing electrohypersensitivity symptoms are commonly put on drugs for other conditions with similar symptoms, instead of being taught how to create an electromagnetically clean environment to eliminate symptoms.

Havas' new study adds to the growing interest in the health effects of cell phones, which also transmit microwave radiation, broadening the focus beyond cell phones' association with brain tumors to their potential effect on other systems, including the heart. It also raises serious concern about risks of exposing schoolchildren to Wi-Fi networks, providing a possible explanation for why some children in schools with Wi-Fi are being diagnosed with, and medicated for, heart irregularities that they believe may linked to Wi-Fi. (See CBS News Coverage on Dangers of Wi-Fi in School and Canadian Global TV Coverage of Dangers of Wi-Fi in School)

"What we found is what many people have said for a long time about devices that emit microwaves," stated Dr. Havas. "People don't just feel ill, their heart begins to race and this is measurable with medical heart monitoring devices."

AUDIO INTERVIEW WITH DR. HAVAS

In the image below, from the study "Provocation Study using Heart Rate Variability Shows Radiation from 2.4 GHz Cordless Phone Affects Autonomic Nervous System" by Havas et al, Subject B experienced an increase in heart rate on exposure to a nearby portable phone. The heart rate immediately returned to the baseline after the cordless phone was unplugged.



[Download Image Here](#)

Havas' study in the *European Journal of Oncology* on heart rate variability was blinded, which means that the volunteers did not know when the phone was on or off. Forty percent (40%) of subjects had a moderate to severe reaction only when the phone's base station was on, and emitting microwaves. Those who responded experienced arrhythmia (irregular beats of the heart) and/or tachycardia (rapid heart rate). The symptoms were often accompanied by feelings of pain or pressure in the chest and anxiety that would appear and disappear for no apparent reason.

This is the first study documenting immediate and dramatic changes in heart rate associated with microwave radiation exposure at levels of exposure well below (0.5%) federal guidelines in Canada and the United States (1000 microW/cm²). It points to the extraordinary inadequacy of current exposure guidelines to protect the public's health.

Havas states, "While not everyone who is electrically sensitive responds in this manner, those who do will have difficulty being in environments where microwave radiation is present, which is virtually everywhere in our modern, wireless culture." She adds, "Cordless phones and cell phones as well as wireless computers and wi-fi networks generate this form of microwave radiation."

Additional symptoms of EHS include headaches, fatigue, difficulty concentrating, poor short-term memory, difficulty sleeping, skin problems, tinnitus, nausea, and dizziness. Many of these symptoms are subjective and difficult to measure.

Havas' study heralds the ability of health practitioners to determine if cardiac irregularities might be

triggered by electromagnetic radiation, using readily available assessment technology, before resorting to invasive or chemical symptom-suppressing cardiac therapeutics.

READ STUDY PUBLISHED IN THE EUROPEAN JOURNAL OF ONCOLOGY October 23, 2010

Dr. Havas is a world-renowned expert in electromagnetic fields. Her teaching and research is concerned with the biological effects of electromagnetic pollution including radio frequency radiation, electric and magnetic fields, dirty electricity and ground current. She is author of the *BRAG Antenna Ranking of Schools Report*, which teaches schools how radiation exposure from neighborhood cell phone towers and antennas can be assessed and remediated, *Zory's Archives*, an ongoing review of thousands of recently released studies on the biological effects of electromagnetic fields, dating back over a half century, drawn from U.S. government and military, and Russian and Eastern European, sources, and co-author of *"Public Health SOS: The Shadow Side of the Wireless Revolution"*.

On November 18th in San Francisco, Dr. Havas will present research at the Commonwealth Club of California demonstrating schools that use Wi-Fi may be putting students at great risk. The half-day program, *"The Health Effects of Electromagnetic Fields"*, will feature experts from the U.S., Canada, Sweden, Norway and the U.K. They will review the state of the current science showing biological effects from cell phones, cell towers, wireless networks, dirty electricity and radiation-emitting 'Smart Meters'. A case will be presented for revision of worldwide exposure guidelines for radiation-emitting technologies. (www.commonwealthclub.org)

Dr. Magda Havas can be reached at: 705 748-1011 ext 7882 or by email: mhavas@trentu.ca

Video Reply to Questions Regarding Whether Electromagnetic Interference Played a Role in Results

Electromagnetic
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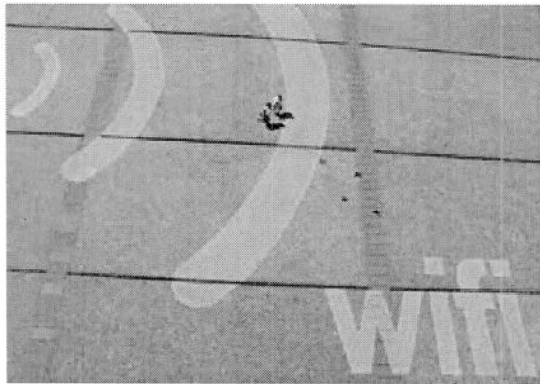
← MEDIA ADVISORY: Commonwealth Club of California To Host Program on "The Health Effects of Electromagnetic Fields" from Cell Phones, Wireless Technologies and Smart Meters – November 18th, 11:15 a.m. – 4:30 p.m.

OMEGA EMF NEWS ROUNDUP (10/23/10) →

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Wifi, EMFs : Electrosensitivity (ES, EHS) physiologically explained at last - 15/03/2012

FRANCE



In 2007, a number of libraries employees in Paris complained about headaches, nausea... right after massive installation of wifi emitters in their offices. This led to a fight between Paris' city hall and worker unions (giving way to the set up of a citizen conference on proliferation of EMFs in Paris)

At French National Library BNF, and more recently in Paris subway transport company RATP, it is in the same deleterious conditions that the debate takes place between unions and corporations, relative to questions about health implications at work relative to the in-flow

of those new wireless technologies in businesses. Everyone in this file has now access to a first medical answer relative to intolerance to EMFs published in Canadian Newspaper " La Maison du 21ème Siècle"

French researchers have just shown that Electromagnetic Fields (EMFs) does notably modify blood and grain physiology in ES people, and that the impact on those biological markers rises and falls with intensity of the exposure. "We do know with certainty that Electrohypersensitivity is not psychosomatic", tells us Oncologist Pr. Belpomme in a telephone interview. "EMFs do trigger major effects in the brain. The most important effect is the opening of the blood-brain barrier. This allows mercury, organochlorates and other toxics to pervade through the brain, where they cause diverse ailments and neurodegenerative diseases." Pr Belpomme records having 20 new patients per week.

An Oncology Professor at Paris Descartes University, Pr. Belpomme is president of the Association for Therapeutic Research Against Cancer (french acronym ARTAC, artac.info), which shifted to cancer prevention from 2004 on. Since may 2008, his team studies what he named Electromagnetic Fields Intolerance Syndrom (french acronym SICEM). "I have 450 patients and I see up to 20 new patients each week, including children with headaches, memory loss, attention or language troubles. We have the biggest cluster in Europe of electrosensitive patients. This is a major problem in public health."

ES, or SICEM, is an extreme reaction to fairly low exposure levels to electric and magnetic fields of low frequency (50-60Hz) emitted by electric wires and electrical appartus, up to 10MHz or 300GHZ radiofrequencies, including microwaves, of wireless devices and their antennaes. This syndrome is recognized in Sweden as a handicap giving way to diverse modifications of the environment by protecting devices that can be state-subsidized to lower exposures.

Most sensitive cases are wrongly imputed to psychiatry : their symptoms (cardiovascular, dermatological, neurological and muscular) are so strong they have to protect themselves with special clothing, paints, metal shieldings, ideally connected to the electrical ground. Others move to forests, caves, and remote places, far away from EMF emissions.

Pr. Belpomme's team put up a diagnosis method based on blood tests and a special type of electroencephalogram (pulsed doppler echographics) which enables them to visualize blood flows in the brain. "Those kind of patients are sure to have troubles in brain vascularization", says the oncologist.

Besides, biological tests demonstrates that 30% have elevated histamine rates, 50% have elevated rate

of stress proteins, most of them have a very low rate of melatonin (anticancer hormone), and 30% have antibodies and protein rates which indicates a thermal shock and speak for brain suffering." he adds that half of his patients also develop hypersensitivity to man-made chemicals, both syndromes sharing common brain anomalies.

The oncologist explained us there were 3 distinct levels of sensitivity to pollutants. At first, there is intolerance, triggered by pollutants polymorphism. "This means we are all different. For instance, 30% of the general population has the biggest risk of contracting cancer." Then lies susceptibility, a factor demonstrated by his Swedish colleague Lennard Hardell who observed 16 families with bigger ES because of heredity. There also are active susceptibility factors "such as dental amalgams which act up as antennas" catching the waves. Then, ES manifests in two steps : "the first step is that of induction with overexposure to a specific frequency of EMFs, either acute or chronic way, such as speaking on a mobile phone for 20 minutes a day, says Pr. Belpomme. The first signs of hypersensitivity are pain and a feeling of heat in the ear. The second step is constitution of the disease. Then sensitivity builds up and the person becomes intolerant to all frequencies."

The scientific council of ARTAC, a team made of experimented researchers, is presided by Dr. Luc Montagnier, co-Nobel Prize 2008 for discovering AIDS causing human immunodeficiency virus (HIV). ARTAC research coordinator, nutrition specialist Dr Philippe Irigaray, is one of the 5 international experts to have been recently invited by Health Research Funds in Quebec and who selected the best research project in Environmental cancer prevention. Philippe Irigaray underlines that the human brain contains magnetosomes, iron oxides which behave like magnets. ES could depend on their quantity, which varies from person to person.

Those researchers are nowadays preparing 5 articles on electrosensitivity. "This requires a lot of time, says Pr. Dominique Belpomme. They will be published in one year or two." But independent and immediate action is required to reduce overexposure of people to EMFs, adds he. In France alone, an estimates gives 5% of people being electrosensitive, and the proportion rises up with the spreading of wireless technologies. "Studies show that 10 to 50% of population will face becoming very intolerant to EMFs in the next 25 to 50 years. Two patients of mine have been hit by multiple sclerosis triggered by overuse of cell phones, 3 cases of breast cancer, among which 2 relapses after overexposure to EMFs, daily use of computers - and proof is building up against autism and Alzheimer's disease, which seem to be triggered with higher risk than cancer by EMF exposure. Causality is really possible."

Fortunately, this practitioner does provide relief to patients as he administrates them nervous system tonics and helps blood brain barrier close down with antihistaminics. According to World Health Organization (WHO), there is no established link. In 2005, WHO claimed that ES symptoms could be psychosomatic or linked to other causes (bad vision, poor air quality, poor ergonomics, etc...) "There is no such thing as clear diagnosis criteria to this health problem, neither is there any scientific basis permitting to connect ES symptoms to EMF exposure (...)Well controlled studies in double-blind showed that those symptoms were not correlated to EMF exposure." To Pr. Dominique Belpomme, this is utter nonsense. "This is a political backwardness which shows nothing of scientific nature. WHO will have to revise its judgment in the upcoming months. This is societal denial which doesn't take into account nowadays knowledge which permanently builds up."

According to this oncologist, the cause-consequence link between EMF fields and leukemia is no longer to be doubted. "When doses shoots up, leukemia shoots up accordingly. Dozens of toxicological lab studies show that in the most obvious way, in vivo and in vitro."

Ontarian Researcher Magda Havas, from Trent University, claims that negative results to ES testings are compromised by major flaws "Researchers would presume that reactions are instant albeit very often there is a backlash delay. People are not instantly reactive electrical switches. Those studies erroneously infer that if nothing can be felt, then it shouldn't be harmful. We do very well know that

you cannot detect the taste of arsenic, lead, DDT, asbestos ; yet all of those are toxics."

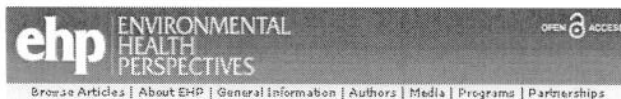
Link to article in french : http://www.robinstoits.org/Wifi-dans-les-bibliotheques-et-ailleurs-L-intolerance-electromagnetique-enfin-elucidee-Blog-social-et-culturel-de-la_a1648.html

Translation courtesy Emilie Paniagua from Robin des Toits french national EMF and Health association.

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Research Article

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Study of self-reported hypersensitivity to electromagnetic fields in California.

Patrick Levallois, Raymond Neutra, Geraldine Lee, and Lilia Hristova

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Abstract

Cases of alleged hypersensitivity to electromagnetic fields (EMFs) have been reported for more than 20 years, and some authors have suggested some connection with the "multiple chemical sensitivity" illness. We report the results of a telephone survey among a sample of 2,072 Californians. Being "allergic or very sensitive" to being near electrical devices was reported by 68 subjects, resulting in an adjusted prevalence of 3.2% (95% confidence interval = 2.8, 3.7). Twenty-seven subjects (1.3%) reported sensitivity to electrical devices but no sensitivity to chemicals. Characteristics of the people reporting hypersensitivity to EMFs were generally different from those of people reporting being allergic to everyday chemicals. Alleging environmental illness or multiple chemical sensitivity diagnosed by a doctor was the strongest predictor of reporting being hypersensitive to EMFs in this population. Other predictive factors apart from self-reporting chemical sensitivity were race/ethnicity other than White, Black, or Hispanic; having low income; and being unable to work. The perception of risk of exposure to EMFs through the use of hair dryers (vs. exposure to power and distribution lines) was the factor the most associated with self-reporting about hypersensitivity to EMFs. However, risk perception was not sufficient to explain the characteristics of people reporting this disorder.

Full Text

The Full Text of this article is available as a [PDF \(524K\)](#).

Selected References

These references are in PubMed. This may not be the complete list of references from this article.

- Andersson B, Berg M, Arnetz BB, Melin L, Langlet I, Lidén S. A cognitive-behavioral treatment of patients suffering from "electric hypersensitivity". Subjective effects and reactions in a double-blind provocation study. *J Occup Environ Med.* 1996 Aug;38(8):752–758. [[PubMed](#)]
- Berg M, Arnetz BB, Lidén S, Eneroth P, Kallner A. Techno-stress. A psychophysiological study of employees with VDU-associated skin complaints. *J Occup Med.* 1992 Jul;34(7):698–701. [[PubMed](#)]
- Bergdahl J. Psychologic aspects of patients with symptoms presumed to be caused by electricity or visual display units. *Acta Odontol Scand.* 1995 Oct;53(5):304–310. [[PubMed](#)]
- Bergqvist U, Wahlberg JE. Skin symptoms and disease during work with visual display terminals. *Contact Dermatitis.* 1994 Apr;30(4):197–204. [[PubMed](#)]
- Cormier-Parry ML, Karakashian GV, Burnett JW. Dermatologic manifestations in users of video display terminals. *Cutis.* 1988 Jul;42(1):16–16. [[PubMed](#)]
- Feldman LR, Eaglstein WH, Johnson RB. Terminal illness. *J Am Acad Dermatol.* 1985 Feb;12(2 Pt 1):366–366. [[PubMed](#)]
- Fisher AA. "Terminal" dermatitis due to computers (visual display units). *Cutis.* 1986 Sep;38(3):153–154. [[PubMed](#)]
- Kreutzer R, Neutra RR, Lashuay N. Prevalence of people reporting sensitivities to chemicals in a population-based survey. *Am J Epidemiol.* 1999 Jul 1;150(1):1–12. [[PubMed](#)]
- Levallois Patrick. Hypersensitivity of human subjects to environmental electric and magnetic field exposure: a review of the literature. *Environ Health Perspect.* 2002 Aug;110 (Suppl 4):613–618. [[PMC free article](#)] [[PubMed](#)]
- Lidén C, Wahlberg JE. Work with video display terminals among office employees. V. Dermatologic factors. *Scand J Work Environ Health.* 1985 Dec;11(6):489–493. [[PubMed](#)]
- Lidén S. "Sensitivity to electricity"—a new environmental epidemic. *Allergy.* 1996 Aug;51(8):519–524. [[PubMed](#)]
- McCarron P, Harvey I, Brogan R, Peters TJ. Self reported health of people in an area contaminated by chromium waste: interview study. *BMJ.* 2000 Jan 1;320(7226):11–15. [[PMC free article](#)] [[PubMed](#)]
- Oftedal G, Vistnes AI, Rygge K. Skin symptoms after the reduction of electric fields from visual display units. *Scand J Work Environ Health.* 1995 Oct;21(5):335–344. [[PubMed](#)]
- Perry GF. Video display terminals: potential health effects of office automation. *Indiana Med.* 1991 Jul;84(7):466–469. [[PubMed](#)]
- Shusterman D, Lipscomb J, Neutra R, Satin K. Symptom prevalence and odor-worry interaction near hazardous waste sites. *Environ Health Perspect.* 1991 Aug;94:25–30. [[PMC free article](#)] [[PubMed](#)]

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Study of Self-Reported Hypersensitivity to Electromagnetic Fields in California

Patrick Levallois,^{1,2} Raymond Neutra,³ Geraldine Lee,³ and Lilia Hristova³

¹Unité de Recherche en Santé Publique, Centre Hospitalier Universitaire de Québec, Beauport, Québec, Canada; ²Institut National de Santé Publique du Québec, Québec, Canada; ³EMF Program, California Department of Health Services, Oakland, California, USA

Cases of alleged hypersensitivity to electromagnetic fields (EMFs) have been reported for more than 20 years, and some authors have suggested some connection with the "multiple chemical sensitivity" illness. We report the results of a telephone survey among a sample of 2,072 Californians. Being "allergic or very sensitive" to being near electrical devices was reported by 68 subjects, resulting in an adjusted prevalence of 3.2% (95% confidence interval = 2.8, 3.7). Twenty-seven subjects (1.3%) reported sensitivity to electrical devices but no sensitivity to chemicals. Characteristics of the people reporting hypersensitivity to EMFs were generally different from those of people reporting being allergic to everyday chemicals. Alleging environmental illness or multiple chemical sensitivity diagnosed by a doctor was the strongest predictor of reporting being hypersensitive to EMFs in this population. Other predictive factors apart from self-reporting chemical sensitivity were race/ethnicity other than White, Black, or Hispanic; having low income; and being unable to work. The perception of risk of exposure to EMFs through the use of hair dryers (vs. exposure to power and distribution lines) was the factor the most associated with self-reporting about hypersensitivity to EMFs. However, risk perception was not sufficient to explain the characteristics of people reporting this disorder. **Key words:** electromagnetic fields, hypersensitivity. *Environ Health Perspect* 110(suppl 4):619–623 (2002).

<http://ehpnet1.niehs.nih.gov/docs/2002/suppl-4/619-623/levallois/abstract.html>

Self-reported electric and magnetic field sensitivity (SREMFS) has been described in the literature for nearly 20 years (Bergqvist and Vogel 1997). Most of the reported literature, mainly from Northern Europe, consists of case studies and limited population studies carried out in occupational settings (Levallois 2002). The published data concern essentially some nonspecific dermatological symptoms, mainly subjective (itching, burning, stinging, etc.) and associated with working near video display terminals (Lidén and Wahlberg 1985; Bergqvist and Wahlberg 1994). More recently, a general clinical portrait has been described in which neuroathenic symptoms (dizziness, fatigue, headache, difficulties in concentrating, etc.) seem to dominate, along with nonspecific skin disorders and ocular, gastrointestinal, or respiratory symptoms (Bergqvist and Vogel 1997; Knave et al. 1992; Bergdahl 1995). The common feature of this self-reported health disorder is its acute occurrence with proximity to electrical devices, including certain power lines, and its disappearance when the source is off or not nearby. Also striking is its variable severity, ranging from very mild symptoms to major impairment resulting in increased work absences and eventually unemployment (Bergqvist and Vogel 1997).

Few reports have been published on this issue in North America. Most are short review articles based on European literature (Fisher 1986; Cormier-Parry et al. 1988; Perry 1991), and a few case reports (Feldman et al. 1985; Rea et al. 1991). Based on the

European Commission working group survey (Bergqvist and Vogel 1997), the prevalence of SREMFS is low (from less than a few per million to a few tenths of a percent). However, this range of prevalence was estimated by questionnaires sent to occupational and environmental clinics and to support groups. In fact, no population-based studies for SREMFS have been published.

The literature reports a weak if any association of hypersensitivity with electric and magnetic field exposures (Bergqvist and Vogel 1997; Portier and Wolfe 1998; Leitgeb 1998). However, most of the provocation studies have been negative (Bergqvist and Vogel 1997). In particular, in blind exposure experiments, SREMFS subjects were not able to detect the presence of the fields at low intensities (Anderson et al. 1996; Ofstedal et al. 1995). SREMFS sometimes has been considered a subset of a more general environmental illness and similar to multiple chemical sensitivity (Rea et al. 1991; Berg et al. 1992). Other authors have suggested that it is a manifestation of somatization or conversion of stress (Lidén 1996), but its association with perception of risk has not been studied.

As a result of this limited knowledge, a population-based study was conducted to fill some of these gaps. The main objective of this study was to estimate the prevalence of SREMFS in a random sample of adult Californians. It was also aimed at describing the characteristics of people with SREMFS as well as exploring its possible association to

self-reported chemical sensitivity (SRCS) and medically diagnosed chemical sensitivity (MDCS).

Materials and Methods

General Method and Population

This study is based on questions added from July 1998 to December 1998 to the 1998 California Adult Tobacco Survey (CATS). This survey is an ongoing monthly telephone survey that collects information on tobacco use and other health-related behaviors from a representative sample of the adult Californian population. A screened random-digit-dial sample purchased from a commercial sampling firm was used (California Department of Health Services 1999). Once a household was reached, all persons living in the household ≥ 18 years of age were enumerated and, if more than one was eligible, a computer-generated random selection algorithm was used to select the participant.

Questionnaire

Questions regarding electromagnetic fields (EMFs) and chemical sensitivities were added at the end of the CATS questionnaire. SREMFS was defined as "allergic or very sensitive to getting near electrical appliances, computers or power lines." SRCS was defined as considering oneself "allergic or unusually sensitive to everyday chemicals" and MDCS as being "told by a doctor or other health professional that you had environmental illness or multiple chemical sensitivity." Self-reported history of asthma and hay fever as

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Address correspondence to P. Levallois, Unité de Recherche en Santé Publique, Centre Hospitalier Universitaire de Québec, 2400 d'Estimauville, Beauport, Québec, Canada G1E 7G9. Telephone: (418) 666-7000 ext. 210. Fax: (418) 666-2776. e-mail: patrick.levallois@msp.ulaval.ca

This study was part of the California EMF research program, which is mandated by the Public Utilities Commission with moneys from California utilities. We thank B. Davis, Chief of the Computer Assisted Telephone Interviewing Unit of the California Department of Health Services, for her help. This work was conducted during a sabbatical by P.L. at the California Department of Health Services, Oakland, California.

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well as reported perception of risk from EMFs was also assessed for each participant. A source of EMFs (either distribution power line or hair dryer) was considered risky for the participant if he or she agrees that "it could cause (either definitely or not) some disease." And it was defined as not risky if the participant considered that it was "definitely or probably safe." Other variables, extracted from the general CATS questionnaire, were age, gender, race, education, health plan coverage, employment status, and family income.

Data Analysis

Prevalence rates were estimated using direct adjustment, with weights for age, gender, and race derived from the 1997 California Department of Finance population estimates of the 1998 California population (California Department of Health Services 1999). Characteristics associated with SREMFS were compared with those associated with SRCS to assess the similarities between the two conditions. Comparisons of proportions were done with chi-square analysis and the Fisher exact test. Factors associated with SREMFS in the total population were identified in crude analysis and then evaluated by multivariate logistic regression (Hosmer and Lemeshow 1989). Estimated prevalence odds ratios (PORs) are presented with 95% confidence intervals (95% CIs), and $p < 0.05$ (bilateral test) is considered statistically significant.

Results

We interviewed 2,072 adults for this study. The upper bound of the response rate (proportion of eligible households contacted that had a completed interview) was 84.1%. The response rate calculated according to the Council of American Survey Research Organization (CASRO 1982) was 58.3%. This method assumes that a proportion of households that could not be contacted represents potential eligible households. General characteristics of the 2,072 participants, compared with the 1990 California census, are presented in Table 1. The study sample

was different from the California population for some characteristics. Especially, the study sample contained more females and was slightly older than the California census population (Table 1). This confirms the need to adjust for the estimation of the prevalence of health disorders in the California population.

Among the 2,037 respondents to the EMF sensitivity questions, 68 reported SREMFS, resulting in a crude prevalence of about 3%. Adjusted prevalence of SREMFS was 32.4 per 1,000 (95% CI = 28.0, 36.8). Mean age of subjects reporting SREMFS was 43.4 years (range = 18–85 years), and mean duration of symptoms was 18.5 years (range = 1–55 years). Adjusted prevalence of people reporting SREMFS associated with necessity to change job or to remain unemployed was 5.20 per 1,000 (95% CI = 3.66, 6.75). Among the 2,063 participants who answered questions on chemical sensitivity, 503 (24.4%) reported SRCS. Adjusted prevalence of SRCS was 230.8 per 1,000 (95% CI = 221.9, 239.7), and lifetime prevalence of reported MDSCS was 33.9 per 1,000 (95% CI = 30.3, 37.5). Figure 1 shows that the two complaints do not totally overlap. About 40% ($n = 27$) of SREMFS subjects did not also report SRCS, and 91.6% ($n = 446$) of patients who reported SRCS did not report SREMFS. Yet 41 individuals (2.0% of all respondents) reported both conditions, and only 27 individuals (1.3% of all respondents) reported SREMFS without SRCS.

Because there was some overlap between SREMFS and SRCS, we compared the characteristics of participants reporting SREMFS ($n = 68$) with those of participants reporting only SRCS ($n = 446$; Table 2). Several differences between the two groups were striking. Compared with those reporting only SRCS, the SREMFS group had fewer females ($p = 0.045$) and fewer Whites and more Hispanic or other races/ethnicities ($p = 0.001$); were less likely to have a health insurance plan ($p = 0.008$); had lower incomes ($p = 0.029$); were most likely to be unemployed ($p = 0.011$); were less likely to report asthma ($p = 0.008$);

and were more likely to report MDSCS ($p = 0.013$).

We also compared the characteristics of the subjects reporting only SREMFS ($n = 27$) with those of subjects reporting only SRCS ($n = 446$). The same tendency was found but with fewer statistical differences: subjects with only SREMFS included fewer females ($p = 0.037$), were more likely to be unemployed ($p = 0.038$), and were less likely to report hay fever ($p = 0.002$) than were subjects with only SRCS. Even though there was some overlap between SREMFS and SRCS, these two disorders appear to be reported generally by different types of people.

SREMFS was then considered the dependent variable, and multiple logistic analysis was conducted to evaluate factors associated with it in the total population. Because age was not mentioned as a key variable in the published literature and was not associated with SREMFS in the crude analysis ($p = 0.83$), it was removed from further analysis. The results of the multivariate analysis are presented on Table 3 along with crude results. Having SRCS or MDSCS was the strongest factor associated with SREMFS: POR = 3.6 and 5.8, respectively. This confirms the association between the two complaints. The other factors associated with SREMFS were being unable to work (POR = 3.8), earning less than \$15,000/year (POR = 2.4), and being from a race/ethnicity other than Black, White, or Hispanic (POR = 4.9).

Because risk perceptions for different EMF sources were very correlated, the effects of perception of risk from power lines, distribution lines, or hair dryers were then included separately in the model. Among those studied, perception of risk from hair dryer exposure was found to be the most strongly associated with SREMFS: adjusted POR = 2.4 (95% CI = 1.2, 4.9). Perception of risk from distribution lines was also associated with SREMFS but to a lesser degree: adjusted OR = 2.0 (95% CI = 1.0, 3.9). Possible effect modification of risk perception was evaluated. None of

Table 1. General characteristics of the 2,072 respondents of the 1998 EMF California study compared with 1990 California population.

Characteristics	Study sample		California population (%)
	n	%	
Age (years)	18–24	219	10.6
	25–34	486	23.5
	35–44	521	25.1
	45–54	345	16.7
	55–64	214	10.3
	≥65	287	13.9
Gender	Male	913	44.1
	Female	1,159	55.9
Race/ethnicity	White	1,251	60.4
	Hispanic	525	25.3
	Black	111	5.4
	Other	185	8.9

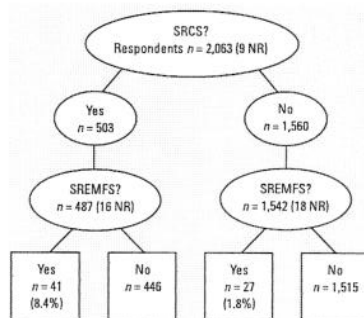


Figure 1. Answers to questions regarding SRCS and SREMFS. NR, nonrespondents.

the three indicators of EMF risk perception was found to be a significant modifier (using Breslow-Day test) of the associations described above. Finally, the possible confounding effect of risk perception was also evaluated. Association of SREMFS with specific subject characteristics remained quite stable after considering perception of risk from EMFs (Table 3), therefore confirming that perception of risk was not an explanation for the associations identified.

Discussion

SREMFS has been described for a long time in the European literature but mainly based on case studies. This population-based study demonstrates that the prevalence of SREMFS (3.2%) is not at all negligible. Extrapolated to the total adult 1998 California population, it can be estimated that around 770,000 people perceive that they are sensitive to EMFs. Extrapolation to the total 1998 California population for those who decided to change jobs as a result of perceived hypersensitivity to EMFs is still not small, with an estimate of 120,000 of adult Californians.

Strengths of this study should be emphasized. First, to our knowledge, this is the first population-based study on EMF hypersensitivity. Inclusion of specific questions in a well-designed prevalence survey (California Department of Health Services 1999) results in a survey of a random sample of the California population. Second, we specified in the SREMFS questions the main sources of EMFs reported as potential sources of this disorder (electrical appliances, computers, or power lines) as identified by the European Commission working group (Bergqvist and Vogel 1997). Therefore, the SREMFS data reported here can be compared with previous report results. Finally, we were able to compare SREMFS with SRCS to assess similarities between the two conditions because we added to the survey specific questions on chemical sensitivities.

Weaknesses of the study should also be acknowledged. First, sensitivity to EMFs was self-reported and not clinically validated. This makes it difficult to assess how symptomatic or how life-impacted these persons are. However, published literature has also relied on self-reporting of hypersensitivity to EMFs because there are no clear clinical diagnostic criteria for the condition (Levallois 2002). Second, one may also wonder if the sample is representative of the adult California population. Although there was some discrepancy regarding age and gender status of the respondents compared with population data, we were able to adjust for those variables when estimating the prevalence of the conditions. The response rate (58–84%) was very acceptable for such a study, but it is always possible that some

subclasses of the California population were less represented in the sample. Particularly, it is well known that those responding to telephone surveys are more educated than nonresponders (Aday 1989). This is also true to some extent with responders in the present CATS survey (California Department of Health Services 1999). This should be considered in interpreting the results of this study because the reported SREMFS was associated with a lower socioeconomic status.

We can only compare our data with the estimation done by the European Commission group for the European population (Bergqvist and Vogel 1997) because this is the closest to a population-based approach. That study was based on a questionnaire sent to 138 centers of occupational medicine (COMs) and similar centers and 15 support groups from 15 different European countries.

Its objective was to estimate the prevalence of SREMFS in Europe. Response rates were low (49% for COMs) and questions were subjective, based on respondents' estimations of the total number of cases in the country of the COM. The estimated prevalence of SREMFS was from less than a few per million to a few tenths of a percent using as denominators the total of the population of each studied country and as numerators the medians of the estimations of the numbers of cases per country. The occurrence of severe cases was estimated to be one order of magnitude lower. Those estimations are well below what we report in our study. These may be underestimations because they are based on cases having had a contact with either an occupational clinic or a support group and hence have not captured those individuals not actively contacting these groups. Compared with the European

Table 2. Comparison of characteristics of subjects reporting SREMFS to of subjects those reporting SRCS only.

	SREMFS (n = 68)		SRCS only (n = 446)		p-values
	n	%	n	%	
Age (years)					
18–24	8	11.8	44	9.9	0.419
25–34	16	23.5	95	21.3	
35–44	17	25.0	104	23.3	
45–54	11	16.2	78	17.5	
55–64	4	5.9	67	15.0	
≥ 65	12	17.6	58	13.0	
Gender					0.045
Male	28	41.2	130	29.1	
Female	40	58.8	316	70.9	
Race/ethnicity					0.001
White	19	28.4	233	52.2	
Black	2	3.0	32	7.2	
Hispanic	31	46.3	142	31.8	
Other	15	22.4	39	8.7	
Education					0.094
<12 years	23	33.8	88	19.7	
High school graduate	15	22.1	106	23.8	
Some college or technical	15	22.1	130	29.1	
University graduate	15	22.1	122	27.9	
Employment status					0.011
Employed	30	45.5	219	54.9	
Out of work	5	7.6	23	5.8	
Not searching	22	33.3	141	35.3	
Unable	9	13.6	16	4.0	
Income (\$K)					0.029
<15	26	41.3	109	26.7	
15–24	14	22.2	69	16.9	
25–49	12	19.1	109	26.7	
≥50	11	17.5	121	29.7	
Health plan					0.008
Yes	42	61.8	339	76.7	
No	26	38.2	103	23.3	
Disease history					0.008
Asthma					
Yes	9	13.2	126	28.3	
No	59	86.8	320	71.8	
Hay fever					0.084
Yes	42	61.8	324	72.6	
No	26	38.2	122	27.4	
MDCS					0.013
Yes	13	19.1	37	8.3	
No	55	80.9	408	91.7	

Table 3. Factors associated with SREMFS among Californians.

	POR _c	95% CI	POR _{adj}	95% CI	POR _{adj+}	95% CI
Gender						
Female (n = 1,139)	1.13	0.69, 1.85	0.68	0.38, 1.2	0.77	0.39, 1.52
Race/ethnicity						
White (n = 1,230)	1		1		1	
Black (n = 109)	1.80	0.52, 6.19	1.19	0.31, 4.57	1.15	0.28, 4.7
Hispanic (n = 517)	4.07	2.27, 7.27	1.99	0.93, 4.29	1.68	0.68, 4.15
Others (n = 181)	5.76	2.87, 11.55	4.94	2.28, 10.7	4.48	1.91, 10.5
Education						
University (n = 731)	1		1		1	
12 years of some college (n = 1,019)	1.45	0.77, 2.71	0.92	0.45, 1.86	0.84	0.38, 1.85
<12 years (n = 283)	1.02	2.06, 7.87	1.31	0.53, 3.26	1.02	0.33, 3.14
Employment status						
Employed (n = 1,333)	1		1		1	
Out of work/not working (n = 640)	1.79	1.06, 3.01	1.65	0.86, 3.15	1.60	0.77, 3.35
Unable to work (n = 61)	7.04	3.19, 15.50	3.79	1.39, 10.7	3.33	1.07, 10.33
Family income (\$K/year)						
≥25 (n = 1,288)	1		1		1	
15–24 (n = 262)	3.10	1.57, 6.12	2.18	1.00, 4.75	1.52	0.58, 3.99
<15 (n = 331)	4.09	2.64, 8.33	2.43	1.13, 5.24	3.00	1.28, 6.99
Health plan						
No (n = 373)	2.88	1.74, 4.77	1.07	0.55, 2.00	1.07	0.50, 2.30
Disease status						
Asthma (n = 281)	0.95	0.47, 1.94	0.35	0.14, 0.87	0.40	0.15, 1.06
Hay fever (n = 1,015)	1.65	1.00, 2.71	1.42	0.78, 2.20	1.36	0.69, 2.69
Self-reported chemical sensitivity (n = 487)	5.16	3.14, 8.48	3.63	1.98, 6.67	3.36	1.67, 6.76
Medically diagnosed chemical sensitivity (n = 73)	7.50	3.89, 14.47	5.80	2.61, 12.8	5.21	2.03, 13.6

Abbreviations: POR_c, crude POR; POR_{adj}, POR adjusted for all the variables prescribed in the table; POR_{adj+}, POR adjusted for all the variables in the table plus perception of EMF risk from hair dryer use.

Commission estimation, our estimate is 10 times higher for the total of cases as well as for the severe cases (those deciding to change jobs or stop working as a result of this condition).

Our study indicates that SREMFS and SRCS may have different origins because they do not share all risk factors. Despite some important overlap between the two diseases, SRCS was much more prevalent than SREMFS, and there was a clear difference between subjects reporting SREMFS and those reporting only SRCS. In particular, differences in gender and allergic status were striking. The overrepresentation of females in patients reporting chemical sensitivity has been described several times (Interagency Workgroup on Multiple Chemical Sensitivity 1998). It was found particularly in California for SRCS but not for MDCS (Kreutzer et al. 1999). No association between reported SREMFS and gender was found in this study. The positive association between SRCS and allergic status (particularly with asthma) is well known (Kreutzer et al. 1999) but was not found for people reporting SREMFS (in fact, a negative association was found with asthma).

Although the two self-reported syndromes appear to be different, chemical sensitivity—either SRCS or MDCS—was found to be an important risk factor for SREMFS. The association between the two conditions has been proposed by authors on the basis that the two have common nonspecific symptoms (Lidén 1996), and symptoms of sensitivity to electrical

devices were reported by chemical-sensitive patients (Portier and Wolfe 1998).

Apart from SRCS and MDCS, three other factors were associated with reporting SREMFS after adjustment for co-variables: being unable to work, being from a race/ethnicity other than Black, White, or Hispanic, and having low income. Being unable to work might be a consequence of the disorder for the more severe cases. Being from a race/ethnicity other than Black, White, or Hispanic was a surprising risk factor. In California this group is mainly composed of Asians. No explanation was found for such an association, but this should be clarified further. Perhaps misunderstanding the question biased the response to yes for this group. However, because there is a difference in races between those reporting SRCS and those reporting SREMFS, the race association with SREMFS could be real. Finally, the association with low income is rather unexpected. The difference from those reporting SRCS confirms that it is specifically linked to reporting SREMFS. Low education and having no health plan were associated with crude POR but disappeared after using multivariate analysis. No explanation could be found for the association with low income.

Perception of plausible risk from EMF sources was found to be associated with SREMFS, particularly for hair dryer use and to a lesser extent for distribution lines. The association of risk perception from EMFs with SREMFS demonstrates the influence of

perception of risk that has already been described for other symptoms (Shusterman et al. 1991; McMarron et al. 2000). But the persistence of the previous identified associated risk factors when taking into account this possible confounder or effect modifier tends to support the fact that SREMFS is not explained by the perception of risk.

SREMFS has been described mainly in Europe. This is the first study to evaluate this problem in North America. On the basis of a population telephone survey, we found that about 3% of the California adult population self-reports being sensitive to sources of EMFs such as power lines, computers, or electrical appliances and 0.5% decided to change jobs because of it. Although no clinical confirmation of the reported symptoms was available, these data demonstrate that, because of its prevalence and possible life impact, this perception is of public health importance in California and perhaps in North America. The cause of this self-reported disorder is not known (Bergqvist and Vogel 1997; Anderson et al. 1996). Although some relation to EMF exposure may exist, there is some evidence of an important psychological component associated with this disorder, particularly for those reporting general symptoms (Bergdahl 1995). However, the present study showed that perception of risk is not an explanation for the reported syndrome. Moreover, characteristics of people reporting hypersensitivity to EMFs were generally different from those of people reporting chemical sensitivity.

REFERENCES

- Aday LA. 1989. *Designing and Conducting Health Surveys*. San Francisco:Jossey-Bass Publishers.
- Anderson B, Berg M, Arnetz BB, Melin L, Langlet I, Lidén S. 1996. A cognitive-behavioral treatment of patients suffering from "electrical hypersensitivity." *J Occup Environ Med* 38:752-758.
- Berg M, Arnetz BB, Lidén S, Eneroth P, Kallner A. 1992. Technostress. A psychophysiological study of employees with VDU-associated skin complaints. *J Occup Med* 34:698-701.
- Bergdahl J. 1995. Psychological aspects of patients with symptoms presumed to be caused by electricity or visual display units. *Acta Otolol Scand* 53:304-310.
- Bergqvist U, Vogel E, eds. 1997. *Possible Health Implications of Subjective Symptoms and Electromagnetic Fields. A report prepared by a European group of experts for the European Commission, DG V, Solna, Sweden:European Commission DG V, National Institute for Working Life*.
- Bergqvist U, Wahlberg JE. 1994. Skin symptoms and disease during work with visual display terminals. *Contact Dermatitis* 30:197-204.
- California Department of Health Services. 1999. *California Adult Tobacco Survey, SAS data set documentation and technical report 1993-1998*. Sacramento, CA:California Department of Health Services.
- CASRO. 1982. *On the Definition of Response Rates. A special report of the CASRO Task Force on Completion Rates*. Port Jefferson, NY:Council of the American Survey Research Organization.
- Cormier-Parry ML, Karakashian GV, Burnett JW. 1988. Dermatological manifestations in users of video display terminals. *Cutis* 42:16.
- Feldman LR, Eaglestein WH, Johnson RB. 1985. Terminal illness [Letter]. *J Am Acad Dermatol* 12:366.
- Fisher AA. 1986. "Terminal" dermatitis due to computers (visual display units). *Cutis* 38:153-154.
- Hosmer DW, Lemeshow S. 1989. *Applied Logistic Regression*. New York:John Wiley & Sons.
- Interagency Workgroup on Multiple Chemical Sensitivity. 1998. *A Report on Multiple Chemical Sensitivity (Predecisional Draft)*. Environmental Health Policy Committee, U.S. Department of Health and Human Services. Available: <http://web.health.gov/environment/mcs/> [accessed 3 May 2000].
- Knave B, Bergqvist U, Wibom R. 1992. "Hypersensitivity to electricity"—a workplace phenomenon related to low frequency electric and magnetic fields. In: *Worldwide Achievement in Public and Occupational Health Protection Against Radiation, Vol II*. Eighth International Congress of the International Radiation Protection Association, 17-22 May 1992, Montreal, Quebec, Canada. Montreal, Quebec, CN:International Radiation Protection Association, 1121-1124.
- Kreutzer R, Neutra RR, Lashuay N. 1999. Prevalence of people reporting sensitivities to chemicals in a population-based survey. *Am J Epidemiol* 150:1-12.
- Leitgeb N. 1998. Electromagnetic hypersensitivity. In: *Proceedings, International Workshop on Electromagnetic Fields and Non-specific Health Symptoms* (Leitgeb N, ed). 19-20 September 1998, Graz, Austria. European Cooperation in the Field of Science and Technical Research, Project 244bis: Biomedical Effects of Electromagnetic Fields.
- Levallois P. 2002. Hypersensitivity of human subjects to environmental electric and magnetic field exposure: a review of the literature. *Environ Health Perspect* 110(suppl 4):613-618.
- Lidén C, Wahlberg JE. 1985. Work with video display terminals among office employees v. dermatologic factors. *J Work Environ Health* 11:489-493.
- Lidén S. 1996. "Sensitivity to electricity"—a new environmental epidemic. *Allergy* 51:519-524.
- McMarron, Harvey I, Brogan R, Peters TJ. 2000. Self reported health of people in an area contaminated by chromium waste: interview study. *Br Med J* 320:11-15.
- Oftedal G, Vistnes AL, Rhygge K. 1995. Skin symptoms after the reduction of electric fields from visual display units. *Scand J Work Environ Health* 21:335-344.
- Perry GF. 1991. Video display terminals: potential health effects of office automation. *Indiana Med* 84:466-469.
- Portier CJ, Wolfe MS. 1998. *Assessment of Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields*. Working Group Report. Research Triangle Park, NC:National Institute of Environmental Health Sciences.
- Rea WJ, Pan Y, Fenyves EJ, Sujisawa I, Samadi N, Ross GH. 1991. Electromagnetic field sensitivity. *J Bioelectr* 10:241-256.
- Shusterman D, Lipscomb J, Neutra R, Satin K. 1991. Symptom prevalence and odor-worry interaction near hazardous waste sites. *Environ Health Perspect* 94:25-30.

**RUSSIAN NATIONAL COMMITTEE
ON NON-IONIZING RADIATION PROTECTION**

June 19, 2012

Moscow, Russia

Recommendations

**of the Russian National Committee on Non-Ionizing Radiation Protection of the necessity
to regulate strictly the use of Wi-Fi in kindergartens and schools**

Mobile cellular communication is getting more popular among children of different ages. Children excel adult population in the mobile phone calls use. At the same time, there is a daily brain exposure of EMF RF. In addition, all children are constantly exposed of EMF RF from base stations. The problem of the children's health maintenance in the development of wireless communications was set up as priority by World Health Organization.

Electromagnetic radiation from Wi-Fi creates an additional burden for the child brain, whose body is in a state of development and the formation of mental activity. During this period, children are most susceptible to adverse environmental factors (WHO, publication number 3, April 2003).

It is necessary to note that the existing standards have been developed, without consideration of this additional exposure of EMF.

RussCNIRP consider necessary:

1. Ministry of Health and other organizations, responsible for the population safety (including children), should pay attention to the regulation of Wi-Fi use in kindergartens and schools; to the strengthening of sanitary control of the Wi-Fi using and to the development of an appropriate regulatory framework.
2. To recommend the usage of wired networks in schools and educational institutions, rather than a network using wireless broadband systems, including Wi-Fi.

Chairman of RussCNIRP,
Professor



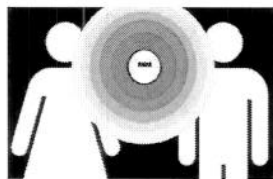
Yury G. Grigoriev

Tel./fax: (+7 499)-190-9660
E-mail: rcnirp@mail.ru

A Primer on FCC Guidelines for the Smart Meter Age

by Amy O'Hair

Why does your utility assert the smart meters they are installing are safe? In a sentence, they are protected by the very high limits the FCC has set for public exposure to radio-frequency (RF) radiation.



The RF radiation from smart meters doesn't exceed those limits, they say, therefore you can't be harmed by it. Leaving aside the fact that smart meter RF pulses may in fact exceed those limits¹, let's look at the FCC "guidelines." **What follows may surprise even those who think they understand the matter....**



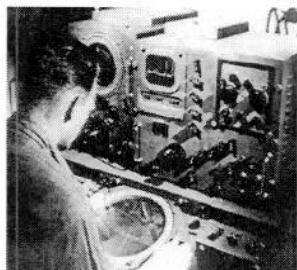
Who is the FCC? What do they do?

The United States Federal Communications Commission² (FCC) was never supposed to look after your health; it's just not their job. They oversee allotting broadcast frequencies across the spectrum; mediate competition between service providers; keep communications up in emergencies; and slap the wrists of celebrities who curse on radio or peel off clothes on TV. The type of oversight they can exercise on "health" matters would be, for example, regulating the frequency of a human-implantable medical-records radio chip³. Whether that chip will produce disease⁴ at the insertion site is none of their concern.

Nonetheless, this is the government agency that has set the upper limit for how much radio-frequency (RF) radiation you can be exposed to from radio transmitters. How and when did they arrive at their "guidelines," and what are those limits? **The science is old, and the limits are sky-high.**

How did we get here?

The history is a long and sordid one⁵, beginning with the military's increasing use of radio technology, especially radar, in the 1950s. They didn't want to kill or maim their soldiers and technicians outright, so they set out to find out what level of RF would injure them. The science that informed that assessment was anchored in the physics-based belief that unless you knocked an electron off a molecule inside a body—which is what x-rays or the radiation still streaming out of Fukushima can do—you couldn't induce cancer or other long term harm.



Radio-frequency radiation doesn't have the energy to dislodge an electron, but it can heat human tissue—and do other things, as we'll see. **The military knew that heating wasn't good, so they based the upper limit for human exposure on this threshold, called the "thermal effect."** FCC limits do protect you from being cooked by a psychopathic neighbor who wants to install an airport-grade radar transceiver on his roof aimed at your house. **But, as it will be clear, this sort of guideline leaves a great deal to be desired in the realm of protecting public health⁶ from short-term "non-thermal" effects and long-term harm.**

How do you measure RF?

Let's start with the units used to measure RF fields in the environment. (Or you can skip ahead to the next page and the rest of the story.) When measuring radio frequency strength in terms of public exposure, you are looking for "power density": that is how much radiating energy is hitting a surface (like your body's surface). If you've read about RF, you may have seen figures like this: $\mu\text{W}/\text{cm}^2$. That means "micro-watts per square centimeter." ('Micro' is represented by a Greek letter 'mu' μ and means 'one millionth'.)

That is to say, $\mu\text{W}/\text{cm}^2$ equals the number of millionths of a watt that are hitting a surface the size of a fingernail. Some people use a different measurement: $\mu\text{W}/\text{m}^2$, micro-watts per square meter, which is how many millionths of a watt are hitting a surface the size of a car rear window. (Your body surface is about 2 square meters total.)

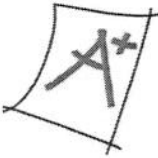
Either unit can be used to represent a power density measurement. To compare the two units: $1 \mu\text{W}/\text{cm}^2 = 10,000 \mu\text{W}/\text{m}^2$. That's because you can fit ten thousand fingernails on a car rear window—10,000 square centimeters inside 1 square meter. Some people who are interested in small amounts of RF that can affect people use the second, smaller unit.

It's like if you were to describe how much water you drink a day, you'd say "32 ounces of water," not "0.08 barrels of water" or "0.00125 cubic yards of water." For sensitive measurements, use the fine-grained unit. Since biological effects have been observed down to low numbers of $\mu\text{W}/\text{m}^2$, that smaller unit is useful for talking about optimal human health conditions. There is a chart online⁷ that lines up all the dozens of different units that electrical engineers use (yes, there are more).

There's also a calculator⁸.

Power density is not the same as the power of the transmitter, but a stronger transmitter will create a larger power density. RF power density drops off in intensity the farther away you are from the transmitter, which is why, for example, people with smart meters near their beds are often the ones to complain of insomnia or waking with headaches.

Congratulations, if you read and understood this section, you now know more about RF power density than 99.9% of the government officials who rubberstamp the wireless industry's endless applications for more cell antennas. **That's enough on units for now—on with the story....**



Low power is the norm for many wireless transmitters

A microwatt doesn't seem like much, does it? **But many radio-frequency transmissions, it turns out, don't require a lot of power, depending on how far they must go before reaching a receiver.** This is part of the reason wireless communication is often a cheap way to transmit data; local transmitters can use small amounts of energy. And of course, there is no costly cable to lay. In many places now you can see wireless antennas on pole tops with no wired-in electricity, just a small solar panel for power.



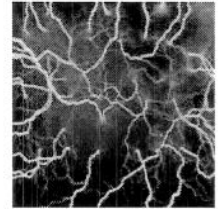
(Left: photo of SFPark.org antenna.) **WiFi transmitters can reach hundreds of feet with just a third of a watt.** Your cell phone can operate with a half- or even a quarter-watt. The older high-power cell phones used to go dead fast because they sucked a lot out of their batteries.

The FCC says the transmitter in a smart meter is supposed to be limited to 1 watt⁹, but we've learned in the last year that the antenna pumps that up to an effective power of 2.5 watts¹⁰. In addition, smart meters contain a capacitor or a battery that produces, at the moment of transmission, a burst of power. **Think of flash units on cameras, which build up power in a capacitor, then release it all suddenly at the moment of the flash, making an intensely bright light, but only for a fraction of a second.** We'd like to know how much power all that adds up to in the smart meter at the moment of the RF pulse, but smart meter manufacturers won't release the specifications on their products or components.

That is not to say that wireless networks overall don't use an enormous amount of power—they do. Cell antenna arrays can have huge power draws. But the RF transmitters which you come into close contact with every day are in general low power.

Low power RF doesn't mean low biological effect

RF transmitters with small amounts of power have definite effects on bodies. As biological organisms, we produce millions of tiny electrical signals internally—regulating our heart, our nerves, our cellular metabolism. In medicine, there are procedures that use RF with small amounts of power, to produce distinct changes in the body. A new treatment kills the malaria parasite¹¹ with cellphone-strength RF (less than 1 watt), **while the researchers blithely state that it shouldn't be used for the head or torso area.** There is a treatment for liver cancer¹² using low-power RF targeted to kill the tumor cells.



How could the FCC—whether or not they have doctors on staff (they don't)—approve the RF used in medical devices, and then not wonder about what is happening in the bodies of the untold numbers of people being exposed to fields that are several thousand times stronger? **They don't wonder; it's not their job.**

Low power is enough power! Enough to: Damage the fetal brain¹³. Make cells leaky¹⁴. Adversely affect the heart rhythm¹⁵. Damage sperm¹⁶. Break DNA¹⁷. Damage DNA¹⁸. Increase glucose in the brain¹⁹. Cut immunity²⁰. Dull memory²¹. Stress genes²². Worsen allergies²³. Weaken bones²⁴. **More²⁵.**

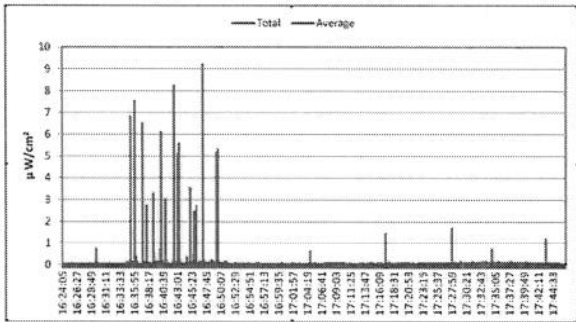
The FCC limits are a terrible joke

So, what are those sky-high limits on RF that the FCC has set? At the cell-phone and smart-meter range of frequencies, the FCC says that a field with an average power density of about 600 $\mu\text{W}/\text{cm}^2$ (the big unit) is okay for humans for 30 minutes. Above that, your tissues begin to heat up, something everyone agrees isn't good. **That's average power density. I'm not sure I can emphasize this point enough:** inside that 30 minutes, there could be a great number of peaks at much higher levels—just as long as the average reading comes out below that stipulated limit.

Time-averaging RF erases peak spikes

With modern technologies which can produce a transmission pattern of millisecond pulses—and all smart meters and cell phones do this—a device can emit pulses which at their peak far, far exceed the FCC upper limit, **yet when averaged will appear to comply with it**, even be far below it. One EMF technician associated with Stop Smart Meters! during his preliminary data gathering has recorded a peak pulse in excess of 20,000 $\mu\text{W}/\text{cm}^2$, and observed ones far higher than this.

Time-averaging is how PG&E hides the true peak levels of RF pulses produced by their smart meters. This chart below shows the stark difference between averaged (red) and actual (blue) RF levels measured from a similar smart meter in southern California (*chart courtesy EMF&RF Solutions, www.EMFRF.com*).



I checked in with an associate who has a PhD in electrical engineering: how many high peaks could you have, and end up with a low average? We invented an example and calculated the average level using information from the FCC’s own document²⁶ addressing the matter. A thirty-minute period could contain one hundred (100) 5-millisecond pulses (at 900MHz) (duty cycle=0.02%), each pulse a whopping 100,000 μW/cm² each (the big unit), and the averaged level could be calculated to be around 28 μW/cm². The device’s maker could then claim this constituted only about “5% of FCC limits.” **But a person standing in that field would actually be subjected to very high bursts of RF energy**, which have been shown to have biological effects.

This engineer then set out to find what the maximum allowable peak pulse is, according to FCC standards, and particular, **what power density would a smart meter pulse be permitted to peak at?** Although there is a reference to a "guideline" of 4,000μW/cm² as determined by *ANSI/IEEE C95.1-1992* in the Sage Report²⁷ discussion on peak power limits, we couldn't find explicit limits stated anywhere else. **Here is a recognized dangerous substance, and there is effectually NO regulation on the upper limit of peak pulses the public is exposed to.**

The time-averaging issue shows up an important point: **patterns of exposure**—like these sharp spikes—are not part of the FCC’s considerations concerning the effects of RF on humans. **This is a serious oversight, and any revision of the FCC guidelines should address this as well.**

The best analogy to these spikes of RF energy is a strobe light. Using the same energy as a low-watt bulb, a strobe light produces very intense millisecond pulses of light, several per second, and has been shown to adversely affect the brain, inducing seizures in some people. RF is an

electromagnetic energy like light, but one that penetrates through the surface of our bodies. (A paper by Karl Maret, MD, has excellent references on pulsed RF effects on humans²⁸.)

Many observers trying to reckon with the sheer number and consistency of smart-meter health complaints²⁹ have seriously wondered whether this particular under-regulated and unaccounted-for factor might be at the heart of the harm done by wireless utility meters.

Many questions are unaddressed by FCC guidelines

Smart-meter pulses aside for a moment, there are many other exposure issues that lie outside the FCC guidelines. **Why isn’t there an effective limit on the maximum peak level?** How much time should pass between 30-minute stints at that high level?

How much total RF are we getting from all the various RF sources in our lives? What about the vulnerable among us? Pregnant women? Children?



What is the biological effect of a low dose over a long period? Over a lifetime? This is a much better description of the modern public exposure pattern than the brief exposures that radar technicians of the 1950s had to contend with.

I admit it is very unlikely that the FCC will address these kinds of questions in the near future. Nor are they passing the matter to any other agency which might have authority regarding public health, such as the FDA or the EPA. Formulation of the original standards could not possibly have foreseen how the vast majority of non-military citizens would end up spending all day, or nearly all day, in a substantial RF field.

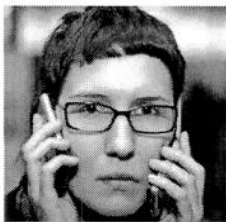
RF exposures have changed; the guidelines have not

There has been no review of the matter at the FCC despite massive changes in technology and consumer behavior. Established in the 1970s based on 1950s science, and firmed up in the **Telecommunications Act (TCA) of 1996**, (just as cellular networks were going up), the guidelines³⁰ have not been reviewed since then—even as usage patterns have changed drastically. For example, for the purposes of the Interphone Study (2004)—which despite massive flaws³¹ is often cited by those who dismiss cell-phone cancer risk—a “regular user” was someone who used a cell phone at least once a week.

Today many users are on their phones two or three hours a day, equaling 800 – 1200 minutes a week—while also being exposed to numerous other RF sources in the environment, like WiFi, cordless phones, antennas, GPS

devices, and smart meters. Smartphones produce nearly constant personal exposures for users via automated network connections.

Has the FCC followed up, as remarkable technological changes have resulted in substantial increases in



personal RF exposure? No. They haven't re-considered the matter in decades. Basic field data is largely untracked. They only measure RF emissions at a tiny fraction of wireless installations—they don't have the staff to investigate. The same goes for the RF levels you get in your own home from consumer devices like cordless phones³². Additionally, it is the Environmental Protection Agency (EPA) who is supposed to regularly assess overall pollution levels in the environment, but they haven't touched RF for four decades since an assessment in 1979³³.

Some who support wireless proliferation say RF transmitters have been with us since the first days of radio, when a few high-power transmitters dotted the country. **But this misses the vital point: at no point in the past have so many people had multiple RF and microwave transmitters so close to their bodies—right next to their heads, in most cases;** there is no science to assure the safety of such close, long-term contact.

In May 2011, the IARC, part of the World Health Organization, finally decided, after years of wrangling, that RF radiation can possibly cause cancer (Class 2B). This decision was arrived at even though many of their members have heavy-duty wireless industry ties³⁴ and have not been known for precautionary vigilance in protection of public health.

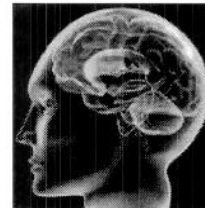
Did this new—though conservative—designation provoke the FCC to review its guidelines? **No. You won't find any changes made in their safety guidelines in light of this landmark.** There is nothing on the FCC website regarding this important announcement.

Why don't FCC limits protect us from harm?

RF bio-effects that fall below that FCC limit are called "non-thermal." **But it turns out "non-thermal" does not mean harmless, it just means not cooking you.** Many things happen to your cellular metabolism, cardiac system, and neurological system, before you get up to the heating point. (See above and references below for more info.)

One of the more disturbing effects is a marked increase in permeability in the blood-brain barrier (BBB)^{35,36}. This vital cellular gatekeeper protects your precious and otherwise vulnerable neocortex from being flooded with the various microscopic gunk you breathe and eat and

touch everyday. Do I need to mention how important your brain is?



RF has other effects on us, and cancer is among them. Admittedly no one wants cancer—but it may be that in the long run, a million people with chronic ill health over several bodily systems may be a more serious public-health problem than a hundred people with cancer. **So searching for definitive cancer effects from RF (though evidence for that is clear³⁷) may actually be distracting regulators from reckoning with the larger picture:** every person in modern society—from conception onward—is exposed to unprecedented levels of RF, and that may represent the true burden of disease, which leaves cancer as the mere iceberg-tip.

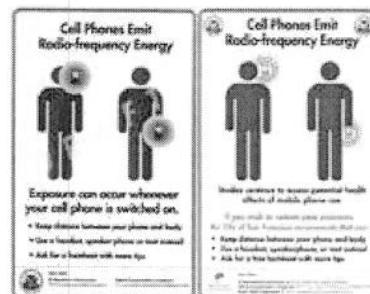
What is a biologically based RF limit for humans?

Who else besides the FCC has addressed the matter of how much RF is all right for humans? **Some scientists have approached the matter by asking how much RF radiation it takes to produce adverse effects in humans.** Using observed biological effects—in the test tube³⁸ and in animals—as well as taking into account what happens in populations of humans who are exposed to things like cell antennas³⁹, they have arrived at very different conclusions about how much we should be exposed to.

How different is a biologically based RF limit from the FCC limit? About ten thousand times different. That's about the size of the spread between the FCC "guidelines" and the level that scientists tracking the actual effects on biological life recommend for human exposure. Example: The Bioinitiative Report⁴⁰ recommends 0.1 $\mu\text{W}/\text{cm}^2$ (big unit) for an outdoor maximum. (See links below for other biologically based guidelines.) To repeat: FCC limit: 600 to 1000 $\mu\text{W}/\text{cm}^2$ vs Bioinitiative: 0.1 $\mu\text{W}/\text{cm}^2$.

Realistically speaking, this massive gap isn't one that can be bridged in the near future. The wireless industry has their back covered by these government regulations, leaving the public uninformed and unprotected.

But cracks are showing. In 2011 San Francisco passed a cell phone right-to-know ordinance⁴¹—but it was promptly silenced by a lawsuit from the wireless industry (CTIA)⁴², then shot down by a federal judge who compared it to warning people about UFOs⁴³. **However, there is slow progress.** In March 2012, the Israeli Knesset passed a law requiring labels on all cell phones⁴⁴ warning users about cancer, and the vulnerability of children.



But the stakes are high for maintaining RF limits where they are now—unprotective, unreviewed, barely enforced, and sky-high. There are now more cell-phone accounts in the U.S. than actual citizens. The proceeds—\$165Billion in the US in 2011—are immense profits for the industry players. On one hand, the bottomless coffers of the wireless industry assure them of compliance from politicians who are ever in need of money, and on the other hand, the industry gets little pushback from the general public, who are largely distracted and entranced with consumer techno-gizmos.

Under federal law, your city cannot prohibit antennas on the grounds of health or environmental damage

Complicating the matter of regulation is the fact that, by law, no U.S. city, county, or state can object to any telecommunications facility (e.g. cell antenna) on the grounds of real or perceived health damage. If this is news to you, I am sorry. I was shocked myself to find this out. This was written into the Telecommunications Act (TCA) of 1996, §704, signed into law by President Clinton, and remains the law of the land^{45,46}. More than one analyst has pointed to how the TCA wrested power from local governments⁴⁷.

Every elected or appointed local public representative is thus prevented from acting to protect public health. **But the public can—and should—still speak out against public harm from wireless facilities.**

So you can be made sick, or sleepless, or get cancer, from your local cell phone tower, and there is nothing, as of now, you can do to legally stop it or get compensation for your injury. You can't sue the industry, and you can't sue your city, state, or federal government, at least not on the grounds of disease. **This particular clause is an outright theft of local governmental power to protect constituents, and must be overturned.**

Perhaps here too, there are changes mounting. In March 2012 Greenwich CT pushed back on the siting of cell towers near concentrations of children, while explicitly citing health concerns as the rationale⁴⁸.

What can we do?

Government regulation is a long way behind the science, and even further behind the so-called “precautionary principle”—the basic notion of protecting people from a pollutant until safe levels have been assessed. The clause quashing objections on health grounds in the TCA (above) leads this citizen to wonder whether the harm to the public from wireless installations was actually fully anticipated by our government and the big-business interests who pushed the bill through in the 1990s. **Why else would they have essentially muzzled any**

effective objections by people or communities trying to protect their health and life? (You are allowed to object on the grounds of ugliness, but now the industry is going to great pains to hide antennas and make them disappear visually⁴⁹.)

Invisible and silent, RF can be scary to contemplate because it can't be sensed by most people. Millions use a cell phone all day with no way to assess their total exposure, or sit next to a cordless phone base or WiFi unit without even being aware that it is a constant source of high levels of pulsed RF.

The current mass addiction to smartphone connectivity⁵⁰ has been compared to cigarette smoking⁵¹. But even in the heyday of cigarettes, 25% of people refused to smoke—perhaps because there was always immediate sensory feedback about it: **anyone can smell smoke, but very few people can sense RF or its effects right away.**

Having a device to measure RF is the only way for most people to know quickly that they are in the presence of RF, and how much. **But it's tedious and somewhat antisocial to always be whipping out a little meter⁵² to find out how much pollution is in the air around you** (having done it for a while now myself).

But that doesn't leave you helpless. Even without a measuring device, there are still very clear things you can do to cut your personal exposure:

- Ditch the cordless phone and get a wired landline;
- Cut your total cell-phone use and configure your phone to avoid automated connections;
- Disable your WiFi unit and wire your internet connection with an ethernet cable;
- And, of course, refuse to allow smart meters on your home or in your neighborhood.

Changing your exposure to these four devices can make a big difference in your total exposure; better sleep can be an immediate benefit for some. **However, for electro-sensitive people⁵³, these measures are often insufficient, and a normal life is very difficult.**

Radio-frequency radiation is a matter of public health

Individual precautions are not enough, because the very nature of RF is that it penetrates bodies and structures—ultimately, it doesn't respect your “personal choices.” One person's actions are not enough to address the issue for EMF-sensitive persons who suffer with very low exposures, and for the vulnerable among us like children, pregnant women, and the aged. Stop Smart Meters! has documented how even those working in high tech can become sensitized over time⁵⁴. Poorly regulated RF has public health consequences⁵⁵.

The lack of meaningful regulation means you may not have any way to avoid the RF radiation you are exposed to at work, or from your local cell phone antenna or your neighbors' smart meters, or on public transportation. **There are numerous situations where RF exposure is in no way a matter of "personal choice."**

"Personal choice" in consumer devices has led to massive involuntary public exposure from ever-proliferating antenna arrays near homes, schools, and public places—like the DAS antennas⁵⁶ currently going up in residential neighborhoods. Mouthing off about "personal choice" has been the devious way that PG&E and other utilities have avoided facing up to the effects their meters have on whole communities, the general public, and those exposed to large banks of smart meters⁵⁷.

While one can and should choose personal self-protection, **it is simply not enough.**

The FCC guidelines for radio-frequency emissions must be changed to protect the public from both harmful incidental exposures and personal consumer-device exposures.

There are people working to institute a review of these outdated guidelines. There are petitions and blogs. There are excellent groups working for cell-phone warnings and public awareness. There are even people like me roaming around measuring RF in their communities⁵⁸ and talking to strangers. **There isn't one single answer.**

Please review the links online⁵⁹ and consider some actions. First and foremost, help yourself or someone you love learn how to avoid unnecessary RF exposure. **Talk to people you know—most people have no idea there is even an issue, so this is a powerful way to change awareness.** Write a letter or email to your legislator. Become a member of a coalition fighting for public awareness. Talk to other parents about WiFi in schools. Show up and speak at a public hearing on cell antennas.

Don't just sit there and get dosed.

More information available at StopSmartMeters.org.

*Amy O'Hair has been researching and measuring smart meters and RF since 2010. She is currently Assistant Director for Research for Stop Smart Meters!
<http://StopSmartMeters.org>. View her videos: <http://youtube.com/ThisIrradiatedLife>. Twitter @vegosapien*

¹ <http://sagereports.com/smart-meter-rf/>

² <http://www.fcc.gov/>

³ <http://tinyurl.com/bvvy3q3>

⁴ <http://tinyurl.com/2k2b47>

⁵ <http://www.emfacts.com/the-procrustean-approach/>

⁶ <http://tinyurl.com/bvys7p3>

⁷ <http://tinyurl.com/7zjsp63>

⁸ <http://www.powerwatch.org.uk/science/unitconversion.asp>

⁹ <http://tinyurl.com/6sagunp>

¹⁰ <http://emfsafetynetwork.org/?p=6030>

¹¹ <http://tinyurl.com/845k7r3>

¹² <http://www.microwavenews.com/HCC.html>

¹³ <http://www.ncbi.nlm.nih.gov/pubmed/22268709>

¹⁴ <http://tinyurl.com/7ezqeqy>

¹⁵ <http://tinyurl.com/7a34msw>

¹⁶ <http://tinyurl.com/boqbhk3>

¹⁷ <http://tinyurl.com/7gnowt7>

¹⁸ <http://tinyurl.com/7u4o8kd>

¹⁹ <http://jama.ama-assn.org/content/305/8/808>

²⁰ <http://www.ncbi.nlm.nih.gov/pubmed/10619445>

²¹ <http://www.ncbi.nlm.nih.gov/pubmed/18044737>

²² <http://www.ncbi.nlm.nih.gov/pubmed/11683499>

²³ <http://www.bastyrcenter.org/content/view/313/>

²⁴ <http://tinyurl.com/bpiqg36>

²⁵ <http://tinyurl.com/24tkny4>

²⁶ <http://tinyurl.com/3tv2vz2>

²⁷ http://sagereports.com/smart-meter-rf/?page_id=216

²⁸ <http://sagereports.com/smart-meter-rf/?p=368>

²⁹ http://emfsafetynetwork.org/?page_id=2292

³⁰ <http://transition.fcc.gov/oet/rfsafety/>

³¹ <http://electromagnetichealth.org/media-stories/>

³² <http://tinyurl.com/bwsybh6>

³³ <http://tinyurl.com/87wt82k>

³⁴ <http://www.microwavenews.com/IARC.RF.Ahlabom.html>

³⁵ <http://www.ncbi.nlm.nih.gov/pubmed/12782486>

³⁶ <http://www.ncbi.nlm.nih.gov/pubmed/18821198>

³⁷ <http://tinyurl.com/czv5uzo>

³⁸ <http://www.youtube.com/watch?v=L7E36zGHxRw>

³⁹ http://eon3emfblog.net/?page_id=2661

⁴⁰ <http://www.bioinitiative.org/report/index.htm>

⁴¹ <http://tinyurl.com/d8yx9hq>

⁴² <http://tinyurl.com/c8voltd>

⁴³ <http://blogs.kqed.org/newsfix/2011/10/20/san-francisco-cell-phone-radiation-law-delayed/>

⁴⁴ <http://tinyurl.com/85ulvte>

⁴⁵ <http://wireless.fcc.gov/siting/fact1.pdf>

⁴⁶ http://www.mttr.org/volthree/mclaren_art.html

⁴⁷ http://arts.envirolink.org/arts_and_activism/BlakeLevitt.html

⁴⁸ <http://tinyurl.com/8vylxwjp>

⁴⁹ <http://tinyurl.com/6vfryec>

⁵⁰ <http://tinyurl.com/7ufgw9v>

⁵¹ <http://www.youtube.com/watch?v=K4uz2TUcwnI>

⁵² <http://www.radmeters.com/Cornet-ED25G-ssm.html>

⁵³ <http://tinyurl.com/6ub6mpm>

⁵⁴ <http://stopsmartmeters.org/2011/12/02/sensitive-and-inside-big-technology-views-from-the-other-side-part-five/>

⁵⁵ <http://stopsmartmeters.org/wp-content/uploads/2012/03/Sage-Carpenter-Public-Health-Implications-Wireless-Tech.pdf>

⁵⁶ <http://tinyurl.com/8819epI>

⁵⁷ <http://stopsmartmeters.org/2011/08/12/pge-i-dont-want-to-be-part-of-your-experiment/>

⁵⁸ <http://youtube.com/ThisIrradiatedLife>

⁵⁹ **Full list of useful links found at the end of the online version of this paper:** <http://stopsmartmeters.org/2012/03/09/a-primer-on-the-fcc-guidelines-for-the-smart-meter-age/>

OR <http://tinyurl.com/7x2rev9>

ELECTRICAL SENSITIVITIES and the ELECTRICAL ENVIRONMENT

Cyril W. Smith, Ph.D.

E:mail: cyril.smith@which.net

A shortened and edited version of notes written for and in cooperation with The Breakspear Hospital, Hemel Hempstead, HP2 4FD, U.K. The writer has been helping their electrically hypersensitive patients since 1982.

What are Electrical Sensitivities?

Many persons suffer from sensitivities to certain foods and environmental chemicals which cause them discomfort, or even in extreme cases prevent them from functioning in any effective manner. Even the most minute amounts of these substances may on occasions 'trigger' reactions which are specific to each individual. Warnings regarding nuts, peanuts or gluten are commonly found displayed on food products. When a sensitivity reaction occurs, some regulatory system within the body has ceased to function properly and gives alarm signals, calling for an unjustified panic reaction. Usually, it is the autonomic nervous system (ANS) which is the first to become compromised in this way. This system controls all the involuntary body functions. Thus, any part or function of the body might become affected by the same allergen acting in different people which is why such effects do not show up in medical statistics.

Those who have already acquired several chemical hypersensitivities and which are 'on-going' are at particular risk of acquiring electrical sensitivities as an additional problem. The allergen 'triggering effect' may transfer from a minute amount of some chemical in the environment to some patient-specific frequency of an electromagnetic field in the environment. Usually, it is the same patient symptoms that continue to be 'triggered'. It is the *frequency* of the electromagnetic field that matters once some patient-specific threshold of intensity or field strength has been exceeded. The range of effective coherent frequencies extends from below a thousand seconds per cycle (circadian rhythms) through audio- and radio- and microwave-frequencies to visible light. All these effects are 'non-thermal': the electrical power is insufficient to produce any significant heating. It is the *frequency* that matters. In technical terms, it is the spectral power density or the *watts per cycle of bandwidth* of the radiation which matters. The more precise the frequency the less power is needed. Coherence makes frequency a fractal linking its chemical, microwave and biological effects.

Germany has introduced the WHO International Classification of Diseases Code T78.4 for 'Chemical-Sensitivity Syndrome Multiple', against which this can be reported and statistics collected. There is no electrical equivalent WHO Classification to date but it would seem reasonable for these cases to be recorded as a complication of the multiple chemical sensitivities which precede the electrical sensitivities. Sweden regards electrical sensitivity as a *disability* with the implication that all public places must be fit for the electrically sensitive disabled person to be in.

The Electrical Environment

Such persons may experience problems from the natural electrical environment beyond what is normal such as the influence of light on melatonin levels. Electrical or acoustic (even sub-audio) frequencies from approaching weather fronts or thunderstorms may become troublesome. Eventually, there may be a hypersensitivity to sunlight.

Fluorescent lighting and lasers at check-outs may make shopping difficult, particularly if inhalants such as chemicals on in-store fabrics provide an initial chemical sensitisation. The patient may experience problems when near any electrical equipment such as power lines, radio- TV- or mobile phone transmitters, tape or DVD-recorders, computers, mobile phones,

satellites or in fact any one of the multitude of electronic devices in the modern environment. It is not necessary for an electrical device to be active, any passive resonant circuit may suffice; this could be the resonant frequency of a row of metal railings in the street. Persons may become aware of actually having electrical devices malfunction when they handle them or, even when in their vicinity.

The female characteristic is towards chronic sensitivities appearing at an early stage, resulting in being labelled as “over-anxious”; the male characteristic is for no reaction until the onset of a sudden and disabling crash which may result in the person becoming completely unable to function normally.

The hazard of chronic over-exposure to electrical frequencies is one of **adaptation** to **symptoms** triggered by a particular pattern of frequencies until they become indistinguishable from a **disease condition**. The problem seems to arise when the frequency pattern of a toxic chemical in the body matches that of the person’s electrical environment. It is the frequencies in the electrical environment which makes the body think it is under chemical attack

Typical Subjective Symptoms Relating to Electrical Sensitivities

Drowsiness, malaise and headache, mood swings, tearfulness and eye pain, poor concentration, vertigo and tinnitus, numbness and tingling, nausea and flatulence, convulsions, noise sensitivity, alteration in appetite, visual disturbances, restlessness, blushing.

Clinical Observations Relating to Electrical Sensitivities

Changes in respiration, heart rate changes (heart rate variability analysis is a good indicator of the status of the ANS), eye pupil dilation, perspiration or lack of it, muscular weakness, loss of visual acuity, speech or writing difficulties, loss of consciousness, convulsions.

At the Breakspear Hospital, about 10% of all patients with chemical, nutritional or particulate sensitivities had acquired electromagnetic sensitivities. Tests often showed stress coming from some common environmental frequency such as the power supply (50Hz in UK, 60 Hz in North America) or the 2.45 GHz frequency of microwave cookers and other devices using this frequency which can effect L- to D- isomerisation in amino acids.

Patients’ reactions were triggered over a very wide range of frequencies for which at first there was no recognisable pattern. Then it was realised that 7.8 Hz often appeared. Measurements quickly revealed that 7.8 Hz was the endogenous frequency of the heart acupuncture meridian. The endogenous frequencies of other acupuncture meridians also appeared when these were under stress. The frequencies on acupuncture meridians are very precise; for 53 heart meridian frequencies from 38 patients, the mean was 7.788 Hz (standard deviation $\pm 0.92\%$). This frequency is used in some therapeutic or environment protection devices. For 50 healthy persons it was $7.802 \pm 0.026\%$. Its precision enables living systems to detect changes in Schumann Band radiation from in the upper atmosphere. .

Sensitivities to Foods and Chemicals

About 1-in-6 of a ‘population’ is usually considered to have some degree of impaired function due to an allergic reaction to the environment or to food. Repeated exposure to a frequency while a person is reacting to some other allergic trigger may link that specific sensitivity pattern to that frequency, so that the same reaction is triggered on encountering either the frequency or the allergen on a subsequent occasion. In general, the patient’s pattern of response is the same whether the trigger is chemical, biological, particulate, nutritional or electrical – *it is characteristic of the patient*.

Exposure to pesticides or herbicides seems to enhance or even create electrical sensitivities. Formaldehyde is a very good sensitizer. Ionising radiation exposure (e.g. long-haul flights) represents an additional stress factor. A few persons may become hypersensitive to light, some to sunlight, or to the light of the mercury vapour spectrum, which is superimposed on the emission from fluorescent tubes and energy-saving lamps.

Dental fillings may cause problems due to electrolytic currents between amalgam fillings

containing different mixtures of metals or, between fillings and surrounding tissue. Patients have been seen with black stains on the palate due to the electrolytic transport of mercury. Amalgam-to-tissue contacts may detect environmental frequencies such as radio transmissions just like a cat's-whisker crystal set. There has been a case where a dentist heard music coming from a patient's mouth. The mercury toxicity frequency and a mobile phone frequency unfortunately happen to stress the parasympathetic branch of the autonomic nervous system.

A common feature of electrical hypersensitivity is that its sufferers complain vigorously that nobody does anything for them, such as turning off an electrical source which they know is "triggering" their reactions but, which seems to have no effect on anyone else. When a hypersensitivity to sunlight is acquired, the futility of this approach is realised but perhaps not before the sufferer has become almost paranoid about these problems.

Treatment

When patients have acquired a high degree of sensitivity to many factors in foods and/or the chemical environment (multiple-sensitivities), they are very likely to have acquired an abnormal sensitivity to their electrical environment as a part of this 'package' of symptoms. It is rare to find electrical sensitivities without on-going chemical sensitivities. This electrical sensitivity can become so severe that a person becomes incompatible with technology and unable to function in the modern environment. Electrical sensitivity is not mutually exclusive of other clinical conditions; it can co-exist with and even trigger physical or mental illness. Electrical sensitivities make diagnosis and therapy more difficult. Medications may produce abnormal responses or side effects, even chronic sensitisation to the electrical environment.

A therapy for alleviating allergic reactions is called provocation/neutralisation therapy. It was developed from earlier work in the USA by Dr. Joseph Miller of Mobile, Alabama, and further developed at the Environmental Health Center, in Dallas, Texas, by Dr. W. J. Rea and at the Breakspear Hospital, Hemel Hempstead, England by its Medical Director, Dr. Jean Monro. This therapy relies on successive serial dilutions of the substance having in sequence the effects of stimulating and/or quelling the reactions that they produce. This therapy is not a substitute for eventually reducing the total body loading of triggering substances to a level that the individual can cope with which can be done by simultaneously increasing the rate of detoxification and reducing the rate of toxin intake until the body can function normally, assuming that the enzyme systems for detoxification are still intact. However, while this can produce an alleviation of the symptoms and thereby assist achieving eventual normalisation, it may not be possible to achieve this without some change in the patient's lifestyle. It is also labour-intensive and therefore expensive.

The general concept introduced by Dr. W. J. Rea is to seek to *reduce the total body load of stressors*. Which stress factors one seeks to reduce may be a matter of choice although some stresses are involuntary through exposure to the general environment. Dr. Rea has demonstrated the reality of electrical sensitivities in double-blind trials¹. The equivalent therapy for alleviating reactions to electrical frequencies involves trying to find one or more frequencies which will turn-off the body's abnormal frequency sensitivity. This is not a cure but it can help stabilise the body for more effective allergy therapy. As foods and chemicals sensitivities are brought under control and the body detoxifies itself, the electrical sensitivities usually disappear as well. Symptoms usually disappear in the reverse order to their appearance. However, it is worth noting that if a person is working or sleeping in a zone of 'geopathic stress', which may be electrical in origin, then their problems may persist and resist therapies.

Reducing the Impact of the Electrical Environment

The sensitive person is best able to determine what affects them. It is impossible to get away from the natural electromagnetic radiation from the sun, the ionosphere, the weather and the geomagnetic field. It is almost impossible to get away from man-made electromagnetic

1. For evidence that electromagnetic field sensitivity actually does exist and can be elicited under environmentally controlled double-blind conditions with 100% reactions to an active frequency and 0% to the placebos, see: Rea WJ. Pan Y. Fenyves EJ. Sujisawa I. Suyama H. Samadi N. and Ross GH. "Electromagnetic Field Sensitivity", *Journal of Bioelectricity* 10(1&2): 241-256 (1991).

radiation. Persons who find a deep canyon or go to the 'out-back' still get zapped when a satellite comes over the horizon. The best indicators for safer places are – mobile phones do not work, TV reception is poor and there are no overhead lines.

In the home, electricity supply meters emit large fields and may be located in a passage on the other side of the wall from a bed-head. From where the power supply reaches the house, its cable may run on an outside wall but, close to a bed. Power lines on overhead poles may act as antennae for radio and microwave transmissions and channel them into the house wiring. It is good practice to turn off all non-essential electrical circuits at night. Power frequencies may have the same effect as daylight in the arctic summer depressing the level of melatonin (an anti-cancer agent). Some biologically based shielding may be provided by pine trees which have terpene problems, cacti or spider-plants.

The power supply frequencies are in effect impossible to shield with any practical measures. Higher frequencies can be shielded by metal wire mesh, metallised fabric or aluminium foil, although these may act as mirrors to reflect the radiation elsewhere. They can also reflect self-radiation emitted by a person having an allergic reaction making it even worse. A very sensitive person may react to a quantum component of the electromagnetic field called the *magnetic vector potential* and this cannot be shielded².

It is rare to find electrical sensitivities without previous and ongoing chemical sensitivities. If a person is sensitised chemically, the electrical sensitivity can be enhanced. Remember that electronic equipment emits chemical fumes and as these may be a trigger for reactions so they need to be ventilated. For example, a person may tolerate the electromagnetic radiation from a television set if it is enclosed in a glass-fronted box ventilated to the outside keeping fumes from the hot plastic out of the room.

Computers have different clock frequencies usually specified in terms of their speed of operation. These frequencies will be sub-divided in the process of carrying out the various computational functions. It may be possible to find a model/manufacturer whose equipment is tolerated. The flat screen displays are likely to have less emission. The pulses emitted when a mobile phone dials-up a number can imprint frequencies into the head if it is held against the ear before dialling is complete.

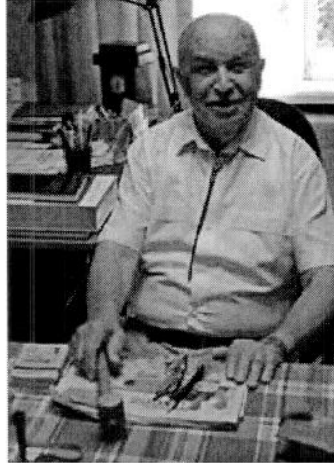
The eye can also be a pathway for frequencies to enter the body such as when viewing TV or a computer. Most acupuncture meridians are stimulated/stressed while viewing a light source flashing at a frequency equal to the endogenous frequency of the meridian. Frequencies greater than 0.05 Hz and less than 47 kHz have this effect as do strong visual patterns and colours. The body as a whole is sensitive to resonances in its environment, so metal structures or even electronic equipment which is not switched on may cause problems. Computer keyboards can have a long cable or an infrared optical link to the computer unit enabling the latter to be kept at a distance. A whole building or public area may be fitted out with a wireless internet link which cannot be avoided. There is software which enables one to dictate to a computer, so that the process of typing in a lot of text can be circumvented; only error correction and editing need be done at the keyboard.

Conclusion

It is rare to find a patient with electrical sensitivities who does not already have multiple ongoing sensitivities to chemicals, volatiles and particulates. To avoid becoming electrically sensitive, one must be careful about acquiring a body load of chemicals which happen to be toxic to you because your body cannot get rid of them quickly. Then, if the frequency pattern of such substances happens to match a pattern of frequencies in your electrical environment this will make the body think it is under further chemical attack. That is why only some people are affected by their electrical environment. Engineers (chemical or electrical) work to specifications, unless they are told that certain environmental frequency patterns cause problems with certain environmental chemicals nothing will ever get done about the problem.

2. Smith C.W. Is a living system a macroscopic quantum system? *Frontier Perspectives*, 7(1), 9-15 (1998), (Temple University, Philadelphia, 1997 lecture to Frontier Sciences Department).

Professor Yury Grigoriev calls for order and the world needs to listen:



Professor Yury Grigoriev

"Man conquered the Black Plague, but he has created new problems - EMF pollution"

The Russian National Committee on Non-Ionizing Radiation Protection has agreed to provide a detailed report for the world containing clear information on the most important Russian research results in RF/EMF radiation over the past 50 years.

RF/EMF researchers and environmental activists, Eileen O'Connor, Director for the UK Radiation Research Trust charity and Sissel Halmøy, Chairman for the International EMF Alliance and Secretary General for the Citizens' Radiation Protection in Norway recently returned from a trip to meet with top scientists at the Russian Federation.

Halmøy said: "According to the RNCNIRP, the following health hazards are likely to be faced by children who use mobile phones in the near future: disruption of memory, decline of attention, diminishing learning and cognitive abilities, increased irritability, sleep problems, increase in sensitivity to the stress, increased epileptic readiness. Action must be taken immediately to adopt biologically based guidelines to protect children." Current standards are based more on engineering needs than biological studies.

O'Connor said "The Russian report is a gift to the world. The UK Radiation Research Trust will present the report in the Autumn to the Rt Hon Iain Duncan Smith MP and will be forwarded to the UK Chief Medical Officer, Professor Dame Sally Davies."

She added "Russian scientists are advanced in their knowledge on RF/EMF radiation and have extended the hand of friendship and are willing to share their expertise and knowledge. I hope decision makers from the western world accept this great honour and work together."

Russian research offers crucial and important aspects of developmental relevance that conveys a sense of urgency for the global RF/EMF framework. Without it, national governments may not be able to ensure the health of future generations are protected, especially that of our children.

Russian warnings exist urging pregnant women to avoid using mobile phones entirely along with children under eighteen. Likewise, Germany, India, the United Kingdom, Israel, Finland, Belgium and Toronto, Canada, have issued health warnings for children to not use mobile phones, or for

emergency use only. Unfortunately, most children, parents, doctors and teachers are not aware of this important information.

Furthermore, in May 2011 the World Health Organisation and IARC issued a classification stating that radio frequency - electromagnetic fields are possibly carcinogenic to humans (group 2B). This warning is issued not only for mobile phones and phone masts, but for Wi-Fi, smart meters, wireless computers and all applications of technology on the RF/EMF Spectrum (radio-frequency radiation to electromagnetic radiation.)

Chairman of Russian National Committee on Non-Ionizing Radiation Protection, member of International Advisory Committee of WHO "EMF and Health" Professor Yury Grigoriev said: "The brain is a critical organ. Vital brain structures are under EMF exposure daily when using a mobile phone. The brain is made up of permanent complex biophysical processes and vital functions. We need to take care with mobile phones and use distance and reduce time. Children should use mobile phones for emergencies only and also use hands free."

Deputy Chairman, Russian National Committee on Non-Ionizing Radiation Protection, Professor Oleg Grigoriev said: "We need correct control and assessment of electromagnetic pollution. There are currently a lot of new frequencies containing modulation and no one knows the results which could be a serious problem."

Russian scientists are also warning countries throughout the world including ministries of health and other organizations, responsible for the population safety (including children), to pay attention to the regulation of mobile phones and Wi-Fi use in kindergardens and are recommending the usage of wired networks in schools and educational institutions, rather than a network using wireless broadband systems, including Wi-Fi.

The Russians stand by their solid research which has consistently shown that prolonged exposure to RF/EMF radiation disturbs cognitive function.

For protection from RF/EMF non-ionizing radiation, many countries have adopted a set of guidelines provided by private group of industry-friendly scientists known as ICNIRP. The ICNIRP guidelines are for short-term, acute thermal RF/EMF exposure. The current ICNIRP, IEEE standards are based on the preconceived and out dated view of government authorities that the only possible established biological effect of RF/EMF exposure is tissue heating.

The Russian standards are supported by science as a result of extensive research and take into account the dangers of non-thermal exposure. The standards are also backed by the Russian Ministry of Health and are a small fraction of what is allowed by ICNIRP and the IEEE which is currently adopted in many counties.

Research clearly underlines the need for action on mobile phones and wireless technology. We need to launch global government backed hard-hitting advertising campaign especially for children, and large health warnings should be clearly visible on all RF/EMF emitting equipment. Mass media campaigns can also create awareness.

O'Connor said: "I am grateful to the Rt Hon Iain Duncan Smith for offering to submit the Russian report to the UK Chief Medical Officer and hope that Government and health agencies worldwide listen to concerns raised by Russian and independent scientists and urgently adopt health based RF/EMF standards to protect human health. We need to provide as swift solution to this problem as soon as possible. We simply cannot afford to wait."

Russian scientists recognise the value of non-Government groups in discussion and research. Deputy Chairman, Russian National Committee on Non-Ionizing Radiation Protection, Professor Oleg

Grigoriev said: "We need to include non-Government groups in discussion and research. Non-Government groups play an equal importance to Government and the scientific community. NGO's are a new power and are representing people with electrosensitivity (ES) and should be an equal player."

He added that "If the decisions are not made together with the NGOs, then decisions may have no value."

The UK Radiation Research Trust, Citizens' Radiation Protection in Norway and International EMF Alliance are calling for the Governments to engage with NGO's and Independent (non-telecommunications funded) scientists.

It's time for action!

Professor Oleg Grigoriev, *Head of Department of Non-Ionizing Radiation*,

Federal Medical Biophysical Center of Federal Medical Biological Agency of Russia

Deputy Chairman, Russian National Committee on Non-Ionizing Radiation Protection

Director, Center for Electromagnetic Safety

Professor Yury Grigoriev, Chairman of Russian National Committee on Non-Ionizing Radiation Protection, a member of Int. Advisory Committee of WHO "EMF and Health"

Sissel Halmøy, Secretary General for the Citizens' Radiation Protection in Norway www.stralevern.org and founder and Chair of International EMF Alliance <http://www.iemfa.org>

Eileen O'Connor, Founder and Board member for the International EMF Alliance and

Director of UK EM Radiation Research Trust www.radiationresearch.org

Contact:

Eileen O'Connor

Email Eileen@radiationresearch.org