Safe Schools

2012

Healthy Schools

Safe Schools

Health Promoting Schools

Proactive Safeguarding

Healthy Development

Optimised Learning

Medical and Scientific Experts Call for Safe Technologies in Schools

Medical Associations, medical doctors and leading scientists call for safe technologies in schools

Introduction

More[1] Medical Associations, medical doctors and scientists, many of whom work on the biological effects of wireless technologies, have expressed their concerns about the safety of wireless devices for schools. They are asking for wired information and communication technologies to be used in order to safeguard[2] children and young people, protect and promote healthy development and maximise learning and achievement.

These experts do not agree with the health protection agencies which currently support or allow the use of microwave, radiofrequency-emitting technologies by children and young people in schools.

Other authorities have also called for the protection of children from wireless technologies.

- Council of Europe: Mobile phone use by pupils in schools to be strictly regulated and wired internet connections to be preferred (Resolution 1815, 2011[3]).
- World Health Organization's International Agency for Research on Cancer (IARC) classified radiofrequency radiation as a possible human carcinogen, class 2B (2011)[4].
- UK Trades Union Congress (TUC): Caution should be taken to prevent exposure to Class 2B carcinogens in the workplace[5].
- European Environment Agency: All reasonable measures to be taken to reduce exposures to electromagnetic fields, especially radiofrequencies from mobile phones and particularly the exposures to children and young adults. Current exposure limits to be reconsidered[6].
- International Commission for Electromagnetic Safety (ICEMS): Strongly advise limited use of cell phones, and other similar devices, by young children and teenagers[7].
- Russian National Committee on Non-Ionizing Radiation Protection have recommended the use of wired networks in schools and educational institutions, rather than wireless broadband systems, including Wi-Fi[8]. *"It is our professional obligation not to damage the children's health by inactivity"*[9].
- German Government and Israeli Parliament recommended wired computer networks for schools or workplaces[10,11].
- Several countries have advised children and young people to limit their use of mobile/smart/cell phones[1].

This document serves to inform schools, Governing Bodies, Academy Trusts, School Boards, Education Authorities, teachers and parents of the professional, medical and scientific concerns about children using wireless technologies in schools. The information can be used to implement safe school policies, practices and guidance in order to safeguard the health and development of children and young people and to aid cognitive abilities, learning and achievement.

Contents

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June 2012. To contribute to a future edition, please contact:

E-mail: contact@wifiinschools.org.uk, Address: BM Wifiinschools.org.uk, London, WC1N 3XX.

Medical Associations

Dr Gerd Oberfeld, MD, Public Health Department, Salzburg, Austria, on behalf of the Austrian Medical Association.

Schools should provide the best possible learning environments. In this context low noise levels, good air quality and low radiofrequency / microwave radiation are crucial. Wi-Fi environments will lead to high microwave exposure for students and teachers which might increase the burden of oxidative stress. Oxidative stress might slow down the energy production especially in brain cells and may lead e.g. to concentration difficulties and memory problems in certain individuals. The Austrian Medical Association recommends Wi-Fi free school environments.

The American Academy of Environmental Medicine

The Board of Officers and Directors: Dr Alvis L. Barrier, MD, FAAOA; Dr Amy Dean, DO; Dr Charles L. Crist, MD; Dr James W. Willoughby, II, DO; Dr Robin Bernhoft, MD; Dr Gary R. Oberg, MD, FAAEM; Dr Craig Bass, MD; Dr Stephen Genius, MD, FRCSC, DABOG, FAAEM, DABEM; Dr Martha Grout, MD, MD(H); Dr W. Alan Ingram, MD; Dr Janette Hope, MD; Dr Derek Lang, DO; Dr Glen A. Toth, MD; Dr Ty Vincent, MD.

The Board of the American Academy of Environmental Medicine approved the following statement on Wi-Fi in schools on 9th June 2012:

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

January 2012:

The Board of the American Academy of Environmental Medicine opposes the installation of wireless "smart meters" in homes and schools based on a scientific assessment of the current medical literature (references available on request). Chronic exposure to wireless radiofrequency radiation is a preventable environmental hazard that is sufficiently well documented to warrant immediate preventative public health action.

The Board of the American Academy of Environmental Medicine also wishes to note that the US NIEHS National Toxicology Program in 1999 cited radiofrequency (RF) *radiation as a potential carcinogen. Existing safety limits for pulsed RF were termed "not protective of public health" by the Radiofrequency Interagency Working Group (a federal interagency working group including the FDA, FCC, OSHA, the EPA and others)* (From AAEM Letter, January 2012, http://wifiinschools.org.uk/resources/AAEM.pdf).

The AAEM asks for:

- *Use of safer technology, including for "Smart Meters", such as hard-wiring, fiber optics or other non-harmful methods of data transmission.*
- *Independent studies to further understand the health effects of electromagnetic and radiofrequency exposures.*
- *Understanding and control of this electrical environmental bombardment for the protection of society.*

(For full list, see: http://aaemonline.org/pressadvisoryemf.pdf; AAEM Position Statement: http://aaemonline.org/emf_rf_position.html). References from the AAEM statements below can be found in: http://aaemonline.org/pressadvisoryemf.pdf.

The AAEM Position Statement on electromagnetic fields includes:

Multiple studies correlate radiofrequency exposure with diseases such as cancer, neurological disease, reproductive disorders, immune dysfunction, and electromagnetic hypersensitivity.

Arguments are made with respect to radiofrequency exposure from Wi-Fi, cell towers and smart meters that due to the distance, exposure to these wavelengths are negligible (2). However, many in vitro, in vivo and epidemiological studies demonstrate that significant harmful biological effects occur from non-thermal radiofrequency exposure and satisfy Hill's criteria of causality (3). Genetic damage, reproductive defects, cancer, neurological degeneration and nervous system dysfunction, immune system dysfunction, cognitive effects, protein and peptide damage, kidney damage and developmental effects have all been reported in the peer-reviewed scientific literature.

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

In an era when all society relies on the benefits of electronics, we must find ideas and technologies that do not disturb bodily function. It is clear that the human body uses electricity from the chemical bond to the nerve impulse and obviously this orderly sequence can be disturbed by an individual-specific electromagnetic frequency environment.

International Society of Doctors for the Environment (ISDE)

Irish Doctors Environmental Association (IDEA)

Both the International Society of Doctors for the Environment [ISDE] and the Irish Doctors Environmental Association [IDEA] have stated, the former by an ad hoc majority opinion of the Directing Board and the latter by unanimous decision of the Executive Committee, that there is sufficient scientific evidence to warrant more stringent controls on the level and distribution of electromagnetic radiation [EMR].

ISDE and IDEA recommendations (full list in Appendix 1):

- *Avoid Wi-Fi in home or work if possible, particularly in schools or hospitals.*
- *Use wired technology whenever possible.*
- *Measure the radiation levels at sites which are occupied for prolonged periods, particularly by infants or young children.*
- *Base stations should not be located on or near [500m] schools or hospitals.*

The Interphone Study organised by the International Agency for Research on Cancer [IARC] – a $20 million study in many countries over 5 years, presented partial results in 2011 of their analysis of 6,600 cancer cases in relation to cell phone use. The results were equivocal but IARC has since designated EMR as "possibly carcinogenic to humans" [Group 2B].

Attention deficit hyperactivity disorder [ADHD] is known to be increasing in prevalence by 3% per year in the USA for which there is no generally accepted explanation. There is evidence from an epidemiological study [Divan, H. et al Epidemiology 19 523-529] from 2008 indicating an association between maternal cell phone use and the prevalence of behavioural problems in children. This was supported by an experimental study in mice from Yale University which demonstrated neurobehavioural defects which persisted into adulthood and was shown to be due to dose-dependent altered neurodevelopmental programming [Aldad T. S. et al Mar 2012 www.nature.com/scientificreports].

Because of the potentially increased risks for the foetus, infants and young children due to their thinner more permeable skulls and developing systems, particularly the immune and neurological systems, based on the precautionary principal and on the mounting evidence for harm at the sub-cellular level, we recommend that EMR exposure should be kept to a minimum. The basic theory is that the younger they are the more likely they are to be damaged for the above reasons and also they will be exposed for a longer period over their lifetime on average.

The Parliamentary Assembly of the Council of Europe Resolution 1815 in 2011 made numerous specific recommendations relating to EMR, the basic message being to maintain radiation levels 'as low as reasonably achievable' [ALARA].

Dr P. Michael, April 2012

Interdisciplinary Society for Environmental Medicine (Interdisziplinäre Gesellschaft für Umweltmedizin e. V.), Germany.

In the Freiburger Appeal in 2002, medical doctors in Germany requested:

- *Ban on mobile telephone use and digital cordless (DECT) telephones in preschools and schools.*
- *Ban on mobile telephone use by small children and restrictions on use by adolescents.*
- *Education of the public, especially of mobile telephone users, regarding the health risks of electromagnetic fields.*
- (Appeal in full: www.planningsanity.co.uk/reports/md341.doc).

Swiss Doctors for Environmental Protection (Ärztinnen und Ärzte für Umweltschutz (AefU)).

The Swiss Doctors for Environmental Protection have not specifically mentioned schools, but have called for caution with respect to wireless technologies:

The International Agency for Research on Cancer (IARC) considers the waves emitted by wireless communication "possibly carcinogenic". According to the IARC, the risk of cancer for this type of radiation is thus similar to that of the insecticide DDT, rightly banned. Doctors for the Environment is concerned that the limit values expected to protect the Swiss population, notably vulnerable groups such as children and pregnant women, constitute insufficient protection. In a communication sent to the Federal Assembly, Doctors for the Environment thus requests strict application of the principle of precaution and – in view of the risk of cancer – lower limit values.

Children's rooms, housing, trams or offices are experiencing a growing exposure to radiation from diverse sources: baby monitors, mobile telephony, Wi-Fi, etc., yet more and more studies warn against the serious health consequences of electromagnetic pollution for human beings and animals.

Dr Peter Kälin, President, states *"From the medical point of view, it is urgent to apply the precautionary principle for mobile telephony, Wi-Fi, power lines, etc."* http://www.aefu.ch/typo3/fileadmin/user_upload/aefu-data/b_documents/Aktuell/M_120322_NIS.pdf

Scientists and Medical Doctors

Dr Igor Belyaev Dr.Sc., Head Research Scientist, Cancer Research Institute, Slovak Academy of Science, Slovak Republic; Associate Professor in Toxicological Genetics, Faculty of Natural Science, Stockholm University, Sweden.

To my opinion, which is based on 25-year research of non-thermal effects of microwaves, usage of Wi-Fi and cell/mobile/smart phones in the classroom should be either forbidden or reduced as much as possible. I believe that the majority of scientists with long lasting experience in this scientific field are of the same opinion. Several national authorities have already advised limiting usage of mobile communication by children. Please, see recent news from Israel by the link below http://www.haaretz.com/business/knesset-backs-bill-requiring-cell-phones-to-bear-health-hazard-warning-1.415677 *, recommendation of the RNCNIRP in the file attached* (Appendix 2) *and my recent review (Belyaev 2010)*[12].

Professor Dr. Nesrin Seyhan, Medical Faculty and Chair of Biophysics Department, Gazi University, Turkey; WHO EMF International Advisory Committee; Panel Member NATO RTA Human Factors and Medicine.

Dr. Seyhan, founder of the Gazi Non-Ionizing Protection Center (GNRK), always opposes radiofrequency sources near schools. She believes that potential adverse health effects from the children's use of Wi-Fi and cell/mobile/smart phone would be greater than with respect to adults. She also recommends that children younger than 16-years-old should not have their own mobile phone. Please find her last publication attached[13].

Professor Lukas H. Margaritis, PhD, Professor Emeritus of Cell Biology and Radiobiology, Dept of Cell Biology and Biophysics, University of Athens, Greece.

Having done experiments on cellular model systems we have found an effect from electromagnetic radiation of ordinary Wi-Fi. I have strongly suggested for years now that they should be used only if absolutely necessary in the home and not at all in schools. There is no reason for having Wi-Fi in schools since there is an alternative - wired connections which are safer and faster.

Dr Stelios A. Zinelis, BA, MD, Hellenic Cancer Society, Cefallonia, Greece

We should not subject and force electromagnetic radiation on school children. Technology can be applied by a wired connection. Effects of the electromagnetic radiation have been well documented and should not be ignored. The past has taught as many lessons, for example asbestos.

Dr Samuel Milham MD, MPH, Epidemiology and Public Health, Formerly Washington State Department of Health, USA.

Wireless technologies have no place in schools. I strongly recommend that where they exist, they be replaced by fiber-optic cable and hard wiring.

Professor Dr. Oleg Grigoriev, PhD, Director of the Russian Centre for Electromagnetic Safety and Vice-Chairman of the RCNIRP.
Professor Yury Grigoriev, Dr. of Medical Science, Chairman of the Russian National Committee on Non-Ionizing Radiation Protection (RCNIRP); member of International Advising Committee on WHO EMF Project.

Our Committee and I are personally against the use of Wi-Fi systems in schools. Professor Yury Grigoriev (chairman of the RCNIRP) has the same opinion. The reason is that it forms a very complex form of electromagnetic field, but in this case the probability of biological effect is higher than when the same total dose is created by one source of unmodulated electromagnetic field. This pattern is for non-thermal electromagnetic fields. There are very good studies that have shown that prolonged exposure to low-intensity radio waves in children disturbed cognitive function, and we trust this research.

RCNIRP recommendation about Wi-Fi in schools and educational institutions, June 2012: http://international-emf-alliance.org/images/pdf/RussCNIRP%20WiFi%2019-06-12.pdf.

Professor Dr. Alvaro Augusto A. de Salles, PhD, Electrical Engineering Department, Federal University of Rio Grande do Sul, Porto Alegre, Brazil.

I believe that responsible governments should act firmly to avoid the use of mobile/smart phones and Wi-Fi in schools.

The main reasons are due to the scientific evidence already available in the international literature (e.g., Bioinitiative report, Pathophysiology 2009, Interphone report, Hardell's group papers, etc) showing health risks even at low level exposure to the non-ionizing radiation (NIR), the 2011 IARC/WHO possible carcinogenic (2 B) classification of the NIR and because due to different reasons, the children are more susceptible to this radiation.

Then the "Precautionary Principle" should effectively be used in this subject and instead of wireless connection, other fixed connections such as twisted pairs, coaxial cables, optical fiber, etc should be available for each student, avoiding therefore exposure during several hours to the NIR.

If serious and responsible decisions are not taken in due time, the price in terms of future generations public health can be very high.

Dr Kevin O'Neill, FRCS (SN), Consultant Neurosurgeon, Charing Cross Hospital, London, UK.

Letter to the British Medical Journal[14]:

You reported (BMJ 2011;342:d3428) on the Council of Europe's recommendation that children be protected from the electro-magnetic radiation emitted by wireless equipment in schools. Since then, the International Agency for Research into Cancer (IARC) has classified such radiation as a possible carcinogen.

The evidence for children's particular vulnerability is accumulating. Most recently a study by the University of Orebro, published in the International Journal of Oncology (Int J Oncol. 2011 May;38(5):1465-74) found almost a fivefold increase of astrocytoma among subjects who started mobile phone use before the age of 20.

Since the Council of Europe has little influence over national health policy and the IARC classification will take time to translate into practical advice, we as medical practitioners and professional bodies have a role in ensuring timely action is taken to protect children. Previous public health threats (tobacco, asbestos, x-rays) indicate that the evidence of risk often increases as research progresses. Given a latency lag of up to 20 years for many tumours, we are in danger of repeating these public health disasters.

Dr David Carpenter, MD, Director Institute for Health and the Environment, University at Albany and Professor Environmental Health Sciences, School of Public Health, USA.

Chronic, such as all-day, school exposure, is more likely than short and intermittent exposure, such as cell phone use, to produce harmful health effects, and is likely to do so at lower exposure levels. Persons stationed close to school computers with WI-FI and especially those very near to any WI-FI infrastructure will receive considerably higher exposure than do others.

Exposure to high-frequency radiofrequency (RF) and microwave (MW) radiation and also the extreme low frequency (ELF) EM fields that accompany WI-FI exposure have been linked to a variety of adverse health outcomes. Some of the many adverse effects reported to be associated with and/or caused by ELF fields and/or RF/MW radiation include neurologic, endocrine, immune, cardiac, reproductive and other effects, including cancers. Human studies of comparable RF/MW radiation parameters show changes in brain function including memory loss, retarded learning, performance impairment in children, headaches and neurodegenerative conditions, melatonin suppression and sleep disorders, fatigue, hormonal imbalances, immune dysregulation such as allergic and inflammatory responses, cardiac and blood pressure problems, genotoxic effects like miscarriage, cancers such as childhood leukemia, childhood and adult brain tumors, and more.

Children are more vulnerable to RF/MW radiation because of the susceptibility of their developing nervous systems. RF/MW penetration is greater relative to head size in children, who have a greater absorption of RF/MW energy in the tissues of the head at WI-FI frequencies. Children are largely unable to remove themselves from exposures to harmful substances in their environments. Their exposure is involuntary. There is a major legal difference between an exposure that an individual chooses to accept and one that is forced upon a person, especially a dependent, who can do nothing about it. WI-FI must be banned from school deployment. http://www.magdahavas.com/wordpress/wp-content/uploads/2012/01/Amended-Declaration-of-Dr-David-Carpenter.pdf

Letter about Wi-Fi in schools: http://wifiinschools.org.uk/resources/Carpenter+letter+Feb2011.pdf.

Dr Martin Blank, Ph.D., Associate Professor of Physiology and Cellular Biophysics, College of Physicians and Surgeons, Columbia University, New York, USA.

Just because we allow microwaves, doesn't mean that Wi-Fi at the same frequency should be allowed into all classrooms.

There is now sufficient scientific data about the biological effects of electromagnetic fields (EMF), and in particular about radiofrequency (RF) radiation, to argue for adoption of precautionary measures. We can state unequivocally that EMF can cause single and double strand DNA breakage at exposure levels that are considered safe under the FCC guidelines in the USA.

EMF have been shown to cause other potentially harmful biological effects, such as leakage of the blood brain barrier that can lead to damage of neurons in the brain, increased micronuclei (DNA fragments) in human blood lymphocytes, all at EMF exposures well below the limits in the current FCC guidelines. Probably the most convincing evidence of potential harm comes from living cells themselves when they start to manufacture stress proteins upon exposure to EMF. The stress response occurs with a number of potentially harmful environmental factors, such as elevated temperature, changes in pH, toxic metals, etc. This means that when stress protein synthesis is stimulated by radiofrequency or power frequency EMF, the body is telling us in its own language that RF exposure is potentially harmful.

It is obvious that the safety standards must be revised downward to take into account the non-thermal as well as thermal biological responses that occur at much lower intensities. Since we cannot rely on the current standards, it is best to act according to the precautionary principle. The precautionary approach appears to be the most reasonable for those who must protect the health and welfare of the public and especially its most vulnerable members, children of school-age. (Letter, Appendix 3).

Dr Olle Johansson, Associate Professor, Karolinska Institute, Stockholm, and Professor, The Royal Institute of Technology, Stockholm, Sweden.

Wireless communication is now being implemented in our daily life in a very fast way. At the same time, it is becoming more and more obvious that the exposure to the electromagnetic fields used by these systems not only may induce acute thermal effects to living organisms, but also non-thermal effects, the latter often after longer exposures. This has been demonstrated in a very large number of studies and includes cellular DNA-damage, disruptions and alterations of cellular functions like increases in intracellular stimulatory pathways and calcium handling, disruption of tissue structures like the blood-brain barrier, impact on vessel and immune functions, association to cancer, and loss of fertility.

Wireless systems, such as Wi-Fi routers and cell/mobile/smart phones, cannot be regarded as safe in schools, but must be deemed highly hazardous and unsafe for the children as well as for the staff.

Dr Magda Havas, PhD, Associate Professor, Environmental and Resource Studies, Trent University, Ontario, Canada.

I am a scientist researching the adverse health outcomes of electromagnetic radiation exposure, including from sources such as WI-FI networks and cell towers. I conducted a study that showed immediate and dramatic changes in both heart rate and heart rate variability associated with microwave exposure to a frequency of 2.4 GHz at levels well below (0.5 percent) federal guidelines. The reactions include heart irregularities, a rapid heart rate, up-regulation of the sympathetic nervous system, and down-regulation of the parasympathetic nervous system.

It is important that children be exposed to the important education, life experiences, and social structures that public education offers, but they must not be risking their health to do so! Children must not be exposed to a constant background of pulsed microwave radiation from WI-FI (or other sources) while at school.

The Internet is an important learning device that should not be taken away. I simply urge that its access be made available through wires rather than Wi-Fi.
http://www.magdahavas.com/wordpress/wp-content/uploads/2012/01/Declaration-of-Dr.-Magda-Havas.pdf

Dr Erica Mallery-Blythe, BM, Emergency Room Registrar, Medical Advisor ES-UK

Radiofrequency radiation was classified last year (2011) as a class 2B carcinogen by the International Agency for Research on Cancer (IARC)/World Health Organization (WHO). This means that Global Health Authorities are concerned that this kind of radiation (used by many kinds of household wireless devices) may cause cancer. There are several convincing mechanisms via which cellular disruption is taking place and all bodily systems are potentially vulnerable. All persons should, in my opinion, take precaution to reduce their exposure to unnatural radiation, including that from non-ionizing, non-thermal sources such as cell phones, Wi-Fi routers, cordless landlines and many others. This advice is particularly important for parents and Education Authorities when creating home and school environments because children are more vulnerable to this kind of radiation.

Science has repeatedly and clearly demonstrated adverse effects of artificial electromagnetic fields on biological systems. It is far too late for timely intervention, but failure to act now with conviction and protect our children could lead to a national health disaster.

Professor Dr. Christos Georgiou, PhD, Professor of Biochemistry, University of Patras, Greece

Every child has the non-negotiable, obvious right to a healthy and safe school environment.

Governments and school boards can no longer trust the wireless communication industry's monotonous slogan that Wi-Fi and cell phones are safe. In May 2011, the World Health Organization (WHO) classified microwave radiation, emitted by such wireless devices, as a possible carcinogen. WHO could no longer ignore the scientific and social pressure from

numerous studies, which have shown that Wi-Fi/cell phone radiation penetrates the body, affects cell membranes, makes cells lose their ability to function properly over time, and disturbs the body's normal metabolism causing numerous abnormalities and diseases.

Children are especially vulnerable to microwave radiation because their nervous system and especially the brain are still developing. Moreover, their skulls are thinner and smaller than those of the adults, so the radiation penetrates their brains more freely and deeply.

Microwave radiation displays in children life threatening short and long term effects: the short term effects are experienced as headaches, dizziness, nausea, vertigo, fatigue, visual and auditory distortion (voices change volume, ringing ears), abnormal heart rates (racing heart rate or tachycardia, erratic heart rates), memory loss, attention deficit (trouble concentrating while in class), skin rash, hyperactivity, anxiety, autism, depression, night sweats, insomnia (microwaves affect melatonin levels), learning impairment, behavioural changes etc; the long term effects are expressed as stress, a weakened immune system, seizures, epilepsy, high blood pressure, brain damage, diabetes, fibromyalgia, infertility, birth defects, DNA damage, leukemia, cancer, etc.

Dr Isaac Jamieson, PhD, DIC RIBA DipAAS BSc (Hons) MInstP, Architect, Consultant and Environmental Scientist, UK.

Proactively addressing 'electromagnetic pollution' issues may significantly aid well-being and achievement in individual schools. It appears sensible for 'Health Promoting Schools', and other schools interested in the well-being of their staff and pupils to consider such matters. (Full Report in Appendix 4).

Professor Dr. Franz Adlkofer, MD, Chairman of Pandora - Foundation for Independent Research.

While the use of mobile phones is the result of people's free choice, their exposure to W-LAN and other wireless applications is mostly compulsory. Especially concerned are children in schools where this technology has been given preference to wired computers. Since our knowledge on possible adverse effects of radiofrequency electromagnetic fields is still rather poor, it is obvious that at present the biggest biophysical experiment of mankind is under way – with an uncertain outcome. In May 2011, the uncertainty has been strengthened by the International Agency for Research on Cancer (IARC) that classified radiofrequency electromagnetic fields as 'possibly carcinogenic to humans'. This decision was mainly based on the results of epidemiological studies that observed after long-term (>10 years) and intensive use of mobile phones an increased risk for brain tumours exactly at the side of the head at which the mobile phone was used. The results from animal experiments, although of minor significance, supported the decision. Yet, results from basic research that showed changes in structure and functions of genes in isolated human and animal cells as well as in living animals after exposure, and that would have given additional weight to the epidemiological

observations, were not taken into account. Had they been included in the evaluation, the classification would not have been 'possibly carcinogenic' but rather 'probably carcinogenic'.

The general public is confronted with two different views, one represented by politics and industry and one by the growing number of independent researchers. Ordinary people have either no idea of the probably adverse effects of radiofrequency radiation or have full confidence in the exposure limits that according to their governments reliably protect from any risk to the health. They do not know that the exposure limits are based on pseudo-science thought to create the necessary legal frame for a telecommunication industry that wants to make use of the new technology without being hampered by medical considerations.

For a medical doctor like me, the conclusion from the present state of knowledge must be that a precautionary approach is overdue and must not be delayed anymore. (Full Statement in Appendix 5).

Dr Vini G. Khurana, MBBS, BSc (Med), PhD, FRACS, Associate Professor of Neurosurgery, Australian National University Medical School; Currently Visiting Attending Neurosurgeon, Royal Melbourne Hospital.

The concerns raised regarding the unnecessary and prolonged exposure of children to near-field radiofrequency electromagnetic radiation (RF-EMR) from mobile phones, wireless laptops (on their laps), and nearby Wi-Fi transmitters in schools are shared by many.

A precautionary approach is realistically achieved without compromising convenience and safety. See for example: http://www.brain-surgery.us/brain_spine_health.html

There are good grounds for adopting such an approach in children, particularly in the context of the WHO's recent classification of RF-EMR as "possibly carcinogenic to humans", and the fact that children may be more susceptible to any adverse health effects of RF-EMR owing to their thinner scalp and skull, increased brain water content, lower brain volume, and rapidly developing neural connections.

Dr Annie Sasco, MD, PhD, Director, Epidemiology for Cancer Prevention, INSERM (Institut national de la santé et de la recherche médicale) Research Unit, School of Public Health, Victor-Segalen Bordeaux 2 Université, France. Formerly International Agency for Research on Cancer (IARC) Unit Chief of Epidemiology for Cancer Prevention.

If we want to wait for final proof, at least in terms of cancer, it may still take 20 years and the issue will become that we will not have unexposed population to act as control. We may never have the absolute final proof. But we have enough data to go ahead with a precautionary principle to avoid exposures (radiofrequencies) *which are unnecessary if our goal is to reduce somewhat the burden of cancer in the years to come and other chronic diseases.*

Dr Alfonso Balmori, PhD, Biologist, Researcher on effects of electromagnetic fields on wildlife, Valladolid, Spain.

The ongoing invasion of radiation caused by Wi-Fi transmitters and other radiofrequency sources represents a denial of scientific evidence and extreme myopia. It is absurd when cable can be used with much greater speeds that schools choose to do so by air. Moreover health must take priority over access to information. Wi-Fi systems are being senselessly installed, even for young children. Society is performing an extremely dangerous and suicidal experiment with them. In it are included not only the children of those who are convinced that electromagnetic radiation is harmful but also the children of the promoters of such systems, both politicians and those who work in the communications industry and also the scientists who deny the evidence. The problems of depression, attention deficit and insomnia in children are increasing worldwide at an alarming rate.

Dr Mae-Wan Ho, PhD, FRSA, Director of the Institute of Science in Society, London, UK.

It is very important for schools and other public places frequented by children to be free of Wi-Fi. The evidence on 'non-thermal' biological effects of very weak electromagnetic fields is now indisputable and children are many times more at risk than adults.

Dr Norbert Hankin, PhD, Environmental Scientist, Office of Radiation and Indoor Air, Environmental Protection Agency, USA.

The growing use of wireless communications by children and by schools will result in prolonged (possibly several hours per day), long-term exposure (12 or more years of exposure in classrooms connected to computer networks by wireless telecommunications) of developing children to low-intensity pulse modulated radiofrequency radiation.

Recent studies involving short-term exposures have demonstrated that subtle effects on brain functions can be produced by low-intensity pulse modulated radiofrequency radiation. Some research involving rodents has shown adverse effects on short-term and long-term memory. The concern is that if such effects may occur in young children, then even slight impairment of learning ability over years of education may negatively affect the quality of life that could be achieved by these individuals, when adults[15]*.*

The individuals listed below signed the Porto Alegre Resolution in 2010, which stated:

We strongly recommend these precautionary practices:

1. Children under the age of 16 should not use mobile phones and cordless phones, except for emergency calls;

2. The licensing and/or use of Wi-Fi, WIMAX, or any other forms of wireless communications technology, indoors or outdoors, shall preferably not include siting or signal transmission in ... schools ... or any other buildings where people spend considerable time.

Franz Adlkofer, Prof. Dr. Med., Verum Foundation, Germany.
Carl Blackman, PhD., CFB, USA.
Martin Blank, PhD. Prof. Columbia Univ., USA.
Devra L. Davis, PhD , MPA , Founder, Environmental Health Trust, USA.
Om P. Gandhi, Sc.D. , Univ. of Utah, USA.
Michael Kundi, PhD. , Medical Univ. of Vienna, Austria.
Henry Lai, PhD., Univ. of Washington, USA.
Leif Salford, MD, PhD., Lund Univ., Sweden.
Carlos E. C. Abrahão, M.D. , Campinas, SP, Brazil.
Adilza C. Dode, M. Sc., MRE, MG, Brazil.
Claudio R. Fernández, M. Sc., IFSUL, Pelotas, RS, Brazil.
Robson Spinelli Gomes, Dr., MP/RJ, Brazil.
Sergio Koifman, M.D., ENSP/Fiocruz, RJ, Brazil.
Renato R. Lieber, Dr., UNESP, Guaratinguetá, SP, Brazil.
Alvaro A. de Salles, Ph.D., UFRGS, RS, Brazil.
Solange R. Schaffer, M.Sc., Fundacentro, SP, Brazil.
Helio A. da Silva, Dr., UFJF, MG, Brazil.
Francisco de A. Tejo, Dr. , UFCG, Pb, Brazil.
Geila R. Vieira, M.D., CGVS/SMS, P. Alegre, RS, Brazil.
Rodrigo Jaimes Abril, Vice Dean, Electrical Engineer, National University of Colombia, Bogota, Col.
Betânia Bussinger, M.D., Biological Effects of Non Ionizing Radiation, UFF, RJ, Brazil.
Simona Carrubba, PhD, Louisiana State Univ. Health Science Center, Shreveport, La, USA.
Claudio Gómez-Perretta, MD, PhD. Centro Investigación, Hospital Universitario La Fe,Valencia. Spain.
Christos Georgiou, PhD., ICEMS, Prof. Biochemistry, University of Patras, Greece.
Karl Braun-von Gladiß. Dr. med., Arzt für Allgemeinmedizin, Deutsch Evern, Germany.
Yury Grigoriev, Professor, Dr. of Medical Science, Chairman of Russian National Committee on Non-Ionizing Radiation Protection, Moscow (Russian Federation).
Magda Havas, PhD. Prof. Environmental Science, Trent University, Peterborough, Ontario, Canada.
Olle Johansson, Assoc. Prof., The Experimental. Dermatology Unit, Department of Neuroscience, Karolinska Institute; and Professor, The Royal Institute of Technology, Stockholm, Sweden.
Lukas H. Margaritis,Professor of Cell Biology and Radiobiology, Athens University, Greece.
L. Lloyd Morgan, Electronics Engineer (retired), USA.
Wilhelm Mosgoeller, MD, Prof. Medical University of Vienna, Austria.
Jerry L. Phillips, PhD. Prof. Dir. Science Learning Ctr. Univ. Colorado, Colorado Springs, USA.
Nesrin Seyhan, PhD., ICEMS, Prof. Medical Faculty of Gazi University, Chair, Biophysics Dept. Turkey Rep/WHO EMF IAC, Panel member, NATO RTO, HFM, Turkey.
David Servan-Schreiber, MD, PhD. Clinical Professor, Psychiatry, Univ. Pittsburgh USA.
Stanislaw Smigielski, MD, ICEMS, Military Institute of Hygiene & Epidemiology, Poland.
Stelios A Zinelis MD, ICEMS, Hellenic Cancer Society, Cefallonia, Greece.
Jose Maria Tiburcio Barroso, engineer, Niteroi, RJ, Brazil.
Elza Antonia Pereira Cunha Boiteux, Prof. Dra.,Faculdade de Direito, Universidade de São Paulo, BR.

Sergio A. Pereira De Borja, Prof. Direito Constituciona, PUC/RS e da Instituicones de Direito, UFRGS.
Elaine S. A. Cabral, M. Sc., Education, Environmental Law; member, Human Rights Commission - of Attorney Association-OAB, J. de Fora, MG, Brazil.
Bill Curry, PhD. Physics, ret. Argonne National Labs, Board Member, EMR Network, USA.
Adamantia F. Fragopoulou, B.Sc., M.Sc., Ph.D. Candidate, EMF Bioeffects, Athens Univ. Greece.
Cristiano M. Gallep, Prof. Dr., DTT, Unicamp, Brazil.
Carol C. Georges, PhD. Psychologist, Italy.
Andrew Goldsworthy BSc PhD, Lecturer in Biology (retired) Imperial College, London, UK.
Laura Elza L. F. Gomes. M.Sc., Prof. da Escola de Arquitetura e Urbanismo da UFF – Universidade - Federal Fluminense.
Sue Grey, LLB(Hons), BSc (Microbiology and Biochemistry), RSHDipPHI, New Zealand.
João Henrique C. Kanan, PhD, UFRGS, RS, Brazil.
Luiz Roberto Santos Moraes, Professor Titular em Saneamento, Universidade Federal da - Bahia, Brazil.
Daniel Oberhausen, Prof. Physics (retired), Association PRIARTÉM, France.
Fanny Helena Martins Salles, psychologist, public official, Prof. University of Bage, RS, Brazil.
Sarah J. Starkey, PhD. Neuroscientist, UK.
Alex W. Thomas, Ph.D, CIHR University-Industry, Chair, Bioelectromagnetics, Lawson Health Research - Institute, University of Western Ontario.
Casper Wickman, PhD, Chalmers University of Technology, Sweden.

Porto Alegre Resolution in full, with all signatures:
http://www.icems.eu/docs/resolutions/Porto_Alegre_Resolution.pdf

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Protecting children and learners from maltreatment; preventing impairment of children's and learners' health or development; ensuring that children and learners are growing up in circumstances consistent with the provision of safe and effective care; undertaking that role so as to enable those children and learners to have optimum life chances and to enter adulthood successfully.

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Papers finding biological or health effects of Wi-Fi signals or Wi-Fi-enabled technologies can be found here: http://wifiinschools.org.uk/22.html

Appendix 1

Statement on Electromagnetic [radio frequency] Radiation [EMR] and Health Risks.

International Society of Doctors for the Environment [ISDE] and the Irish Doctors Environmental Association [IDEA].

Both the International Society of Doctors for the Environment [ISDE] and the Irish Doctors Environmental Association [IDEA] have stated, the former by an ad hoc majority opinion of the Directing Board and the latter by unanimous decision of the Executive Committee, that there is sufficient scientific evidence to warrant more stringent controls on the level and distribution of EMR.

The Interphone Study organised by the International Agency for Research on Cancer [IARC] – a $20 million study in many countries over 5 years, presented partial results in 2011 of their analysis of 6,600 cancer cases in relation to cellphone use. The results were equivocal but IARC has since designated EMR as "possibly carcinogenic to humans" [Group 2B].

ADHD is known to be increasing in prevalence by 3% per year in the USA for which there is no generally accepted explanation. There is evidence from an epidemiological study [Divan, H et al *Epidemiology 19 523-529*] from 2008 indicating an association between maternal cell phone use and the prevalence of behavioural problems in children. This was supported by an experimental study in mice from Yale University which demonstrated neurobehavioural defects which persisted into adulthood and was shown to be due to dose-dependent altered neurodevelopmental programming [Tamir S Aldad et al Mar 2012 www.nature.com/scientific reports

Because of the potentially increased risks for the foetus, infants and young children due to their thinner more permeable skulls and developing systems, particularly the immune and neurological systems, based on the precautionary principal and on the mounting evidence for harm at the sub-cellular level, we recommend that EMR exposure should be kept to a minimum. The basic theory is that the younger they are the more likely they are to be damaged for the above reasons and also they will be exposed for a longer period over their lifetime on average.

The Parliamentary Assembly of the Council of Europe Resolution 1815 in 2011 made numerous specific recommendations relating to EMR, the basic message being to maintain radiation levels 'as low as reasonably achievable' [ALARA].

Recommendations

Personal:

Avoid totally or minimise to essential usage below the age of 14 years

Use ‘hands free’ at all ages.

Minimise duration of calls.

Avoid having the phone on standby on your person, particularly adjacent to the

gonads [testicles and ovaries] or heart.

Avoid using in a motor car or enclosed space.

Avoid use in pregnancy.

Use phone with the lowest Specific Absorption Ratio [SAR].

General:

Avoid living or working within 100m of a base station.

Avoid Wi-Fi in home or work if possible, particularly in schools or hospitals.

If Wi-Fi is present only switch it on when in use.

Measure the radiation levels at sites which are occupied for prolonged periods, particularly by infants or young children.

Base stations should not be located on or near [500m] schools or hospitals.

Use wired technology whenever possible.

Dr P. Michael May 2012

Appendix 2

Children and mobile phones: The Health of the Following Generations is in Danger.

Russian National Committee on Non-Ionizing Radiation Protection.

April 2008
(Page iv)

Russian National Committee on Non-Ionizing Radiation Protection

CHILDREN AND MOBILE PHONES: THE HEALTH OF THE FOLLOWING GENERATIONS IS IN DANGER

Moscow, Russia *14 April 2008*

For the first time in history, we face a situation when most children and teenagers in the world are continuously exposed to the potentially adverse influence of the electromagnetic fields (EMF) from mobile phones.

Electromagnetic field is an important biotropic factor, affecting not just a human health in general, but also the processes of the higher nervous activity, including behavior and thinking. Radiation directly affects human brain when people use mobile phones.

Despite the recommendations, listed in the Sanitary Rules of the Ministry of Health, which insist that persons under 18 years should not use mobile phones (SanPiN 2.1.8/2.2.4.1190-03 point 6.9), children and teenagers became the target group for the marketing the mobile communications.

The current safety standards for exposure to microwaves from the mobile phones have been developed for the adults and don't consider the characteristic features of the children's organism. The WHO considers the protection of the children's health from possible negative influence of the EMF of the mobile phones as a highest priority task. This problem has also been confirmed by the Scientific Committee of the European Commission, by national authorities of the European and Asian countries, by participants of the International scientific conferences on biological effects of the EMF.

Potential risk for the children's health is very high:

- the absorption of the electromagnetic energy in a child's head is considerably higher than that in the head of an adult (children's brain has higher conductivity, smaller size, thin skull bones, smaller distance from the antenna etc.);
- children's organism has more sensitivity to the EMF, than the adult's;
- children's brain has higher sensitivity to the accumulation of the adverse effects under conditions of chronic exposure to the EMF;
- EMF affects the formation of the process of the higher nervous activity;
- today's children will spend essentially longer time using mobile phones, than today's adults will.

According to the opinion of the Russian National Committee on Non-Ionizing Radiation Protection, the following **health hazards** are likely to be faced by the children mobile phone users in the **nearest** 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.

Expected (possible) remote health risks: brain tumors, tumors of acoustical and vestibular nerves (in the age of 25-30 years), Alzheimer's disease, "got dementia", depressive syndrome, and the other types of degeneration of the nervous structures of the brain (in the age of 50 to 60).

The members of the Russian National Committee on Non-Ionizing Radiation Protection emphasize ultimate urgency to defend children's health from the influence of the EMF of the mobile communication systems. We appeal to the government authorities, to the entire society to pay closest attention to this coming threat and to take adequate measures in order to prevent negative consequences to the future generation's health.

The children using mobile communication are not able to realize that they subject their brain to the EMF radiation and their health – to the risk. We believe that this risk is not much lower than the risk to the children's health from tobacco or alcohol. It is our professional obligation not to let damage the children's health by inactivity.

On behalf of members of Russian National Committee on Non-Ionizing Radiation Protection

Chairman, professor

46, Zhivopisnaya Str., 123182 Moscow, RUSSIA
+7-499-193-0187 rcnirp@mail.ru

Appendix 3

Columbia University, College of Physicians and Surgeons

Department of Physiology and Cellular Biophysics Telephone: (212) 305-3644
630 West 168 Street **Telefax: (212) 305-5775**
New York, NY 10032 **EMAIL: mb32@columbia.edu**

May 22, 2009

Ms. Julie Korenstein
Board Member
Los Angeles Unified School District
Board of Education
333 South Beaudry Avenue, 24th Floor
Los Angeles, CA 90017

Re: Health effects of cell tower radiation

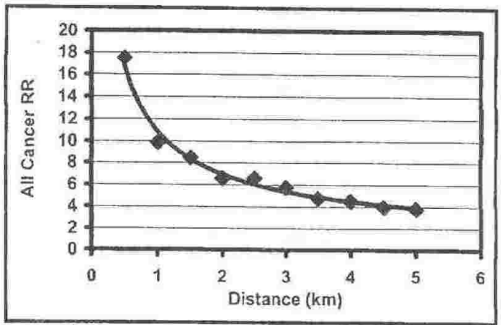
Dear Ms. Korenstein,

As an active researcher on biological effects of electromagnetic fields (EMF) for over twenty five years at Columbia University, as well as one of the organizers of the 2007 online Bioinitiative Report on the subject, I am writing in support of a limit on the construction of cell towers in the vicinity of schools.

There is now sufficient scientific data about the biological effects of EMF, and in particular about radiofrequency (RF) radiation, to argue for adoption of precautionary measures. We can state unequivocally that EMF can cause single and double strand DNA breakage at exposure levels that are considered safe under the FCC guidelines in the USA. As I shall illustrate below, there are also epidemiology studies that show an increased risk of cancers associated with exposure to RF. Since we know that an accumulation of changes or mutations in DNA is associated with cancer, there is good reason to believe that the elevated rates of cancers among persons living near RF towers are probably linked to DNA damage caused by EMF. Because of the nature of EMF exposure and the length of time it takes for most cancers to develop, one cannot expect 'conclusive proof' such as the link between helicobacter pylori and gastric ulcer. (That link was recently demonstrated by the Australian doctor who proved a link conclusively by swallowing the bacteria and getting the disease.) However, there is enough evidence of a plausible mechanism to link EMF exposure to increased risk of cancer, and therefore of a need to limit exposure, especially of children.

EMF have been shown to cause other potentially harmful biological effects, such as leakage of the blood brain barrier that can lead to damage of neurons in the brain, increased micronuclei (DNA fragments) in human blood lymphocytes, all at EMF exposures well below the limits in the current FCC guidelines. Probably the most convincing evidence of potential harm comes

from living cells themselves when they start to manufacture stress proteins upon exposure to EMF. The stress response occurs with a number of potentially harmful environmental factors, such as elevated temperature, changes in pH, toxic metals, etc. This means that ***when stress protein synthesis is stimulated by radiofrequency or power frequency EMF, the body is telling us in its own language that RF exposure is potentially harmful.***



There have been several attempts to measure the health risks associated with exposure to RF, and I can best summarize the findings with a graph from the study by Dr. Neil Cherry of all childhood cancers around the Sutro Tower in San Francisco between the years 1937 and 1988. Similar studies with similar results were done around broadcasting antennas in Sydney, Australia and Rome, Italy, and there are now studies of effects of cellphones on brain cancer. The Sutro tower contains antennas for broadcasting FM (54.7 kW), TV (616 kW) and UHF (18.3 MW) signals over a fairly wide area, and while the fields are not uniform, and also vary during the day, the fields were measured and average values estimated, so that one could associate the cancer risk with the degree of EMF exposure.

The data in the figure are the risk ratios (RR) for a total of 123 cases of childhood cancer from a population of 50,686 children, and include a 51 cases of leukaemia, 35 cases of brain cancer and 37 cases of lymphatic cancer. It is clear from the results that the risk ratio for all childhood cancers is elevated in the area studied, and while the risk falls off with radial distance from the antennas, as expected, it is still above a risk ratio of 5 even at a distance of 3km where the field was 1μW/cm^2. This figure is what we can expect from prolonged RF exposure. In the Bioinitiative Report, we recommended 0.1μW/cm^2 as a desirable precautionary level based on this and related studies, including recent studies of brain cancer and cellphone exposure.

As I mentioned above, many potentially harmful effects, such as the stress response and DNA strand breaks, occur at nonthermal levels (field strengths that do not cause a temperature increase) and are therefore considered safe. It is obvious that the safety standards must be revised downward to take into account the nonthermal as well as thermal biological responses that occur at much lower intensities. Since we cannot rely on the current standards, it is best to act according to the precautionary principle, the approach advocated by the European Union and the scientists involved in the Bioinitiative report. In light of the current evidence, the precautionary approach appears to be the most reasonable for those who must protect the health and welfare of the public and especially its most vulnerable members, children of school-age.

Sincerely yours,

Martin Blank, Ph.D.
Associate Professor of Physiology and Cellular Biophysics.

Appendix 4

Comments on use of Wi-Fi & smart/mobile phones in schools

A Need for Caution?

The recent classification of RF/microwave radiation as a Class 2B carcinogen by the International Agency for Research on Cancer (IARC) (WHO/IARC 2011), the Council of Europe's recommendation that electromagnetic emissions should be "*as low as reasonably achievable*" (PACE 2011) and calls - such as that of the Seletun Resolution (Fragopoulou et al. 2010) - to reduce electromagnetic fields (EMF) exposures, indicate it may be wise to reassess current UK policies as related to the use of Wi-Fi and smart/mobile phone use in schools, particularly as low field alternatives are available. UK unions state "*Caution should be used to prevent exposure to substances in Group 2B*," and that "*the aim should be to remove all exposure to any known or suspected carcinogen in the workplace*" (TUC 2008).

Influence of field regimes on clumping of red blood cells

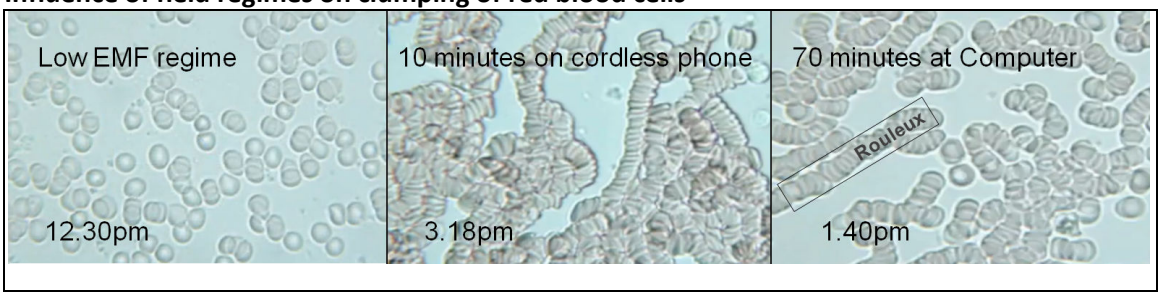
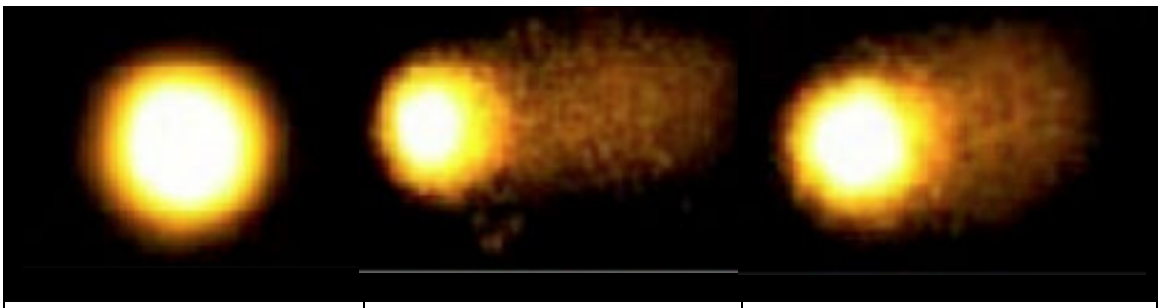


Image source: Havas (2010).

"*Wireless communication is now being implemented in our daily life in a very fast way. At the same time, it is becoming more and more obvious that the exposure to electromagnetic fields not only may induce acute thermal effects to living organisms, but also non-thermal effects, the latter often after longer exposures. This has been demonstrated in a very large number of studies and includes cellular DNA-damage, disruptions and alterations of cellular functions like increases in intracellular stimulatory pathways and calcium handling, disruption of tissue structures like the blood-brain barrier, impact on vessel and immune functions, and loss of fertility*," Johansson (2011).

Comet Assay - a typical picture after RF-EMF-exposition of HL60 leukaemia cells



Sham Image source: Adlkofer (2004).	Gamma-irradiation, 0.5 Gy (1,600 chest x-rays)	24 h mobile phone, RF-EMF, 180 MHz at SAR = 1.3 W/k ICNIRP/WHO = 2 W/kg

The photos above show the effects of different types of radiation on gene expression of human HL60 cells. The damage from radiation from the mobile phone [at levels below current ICNIRP/WHO standards [and which the UK's Health Protection Agency (HPA 2012) currently adheres to], are similar to those resulting from the high dosage of gamma radiation (Adlkofer 2004).

It is noted by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) that "*… children, the elderly, and some chronically ill people might have a lower tolerance for one or more forms of [non-ionising radiation] exposure than the rest of the population."* (ICNIRP 2002).

Some Within Industry Also Suggest Caution

When wishing to consider whether the use of Wi-Fi and smart/mobile phones in schools (and exposing school occupants to such radiation) is appropriate, it is perhaps worth also considering what is being said within some sectors of the telecommunications industry:

> "*I want to be very clear. Industry has not said once - once - that … [RF / microwave radiation is] safe. The federal government and various interagency working groups have said it is safe*." K. Dane Snowden, Vice President, External & State Affairs, CTIA-The Wireless Association®* (Safeschool 2010).

* CTIA - The Wireless Association®, is the International Association for the Wireless Telecommunications Industry. It is "Dedicated to Expanding the Wireless Frontier".

"*The influence of electrosmog* [created by inappropriately design technology – present author's comment] *on the human body is a known problem. ... The risk of damage to health through electrosmog has also become better understood as a result of more recent and improved studies. When for example, human blood cells are irradiated with electromagnetic fields, clear damage to hereditary material has been demonstrated and there have been indications of an increased cancer risk*. ..." Swisscom AG - major Swiss telecommunications provider (Swisscom AG 2003).

Warnings - Mobile phone manuals too now carry warnings: As an example, one states that studies "*have suggested that low levels of RF could accelerate the development of cancer in laboratory animals. In one study, mice genetically altered to be predisposed to developing one type of cancer developed more than* ***twice as many cancers*** [emphasis by current author] *when they were exposed to RF energy compared to controls*," (Motorola 2011).

Another mobile phone manual gives the following guidance: "***When using iPhone near your body for voice calls or wireless data transmission over a cellular network, keep iPhone at least 15 mm (5/8 inch away from the body),*** [emphasis by current author] *and only use carrying cases, belt clips, or holders that do not have metal parts and that maintain at least 15 mm (5/8 inch) separation*." (Apple 2010). The text for that warning was originally in grey in 6 font, making it particularly difficult for many people to read:

> "When using iPhone near your body for voice calls or wireless data transmission over a cellular network, keep iPhone at least 15 mm (5/8 inch away from the body), and only use carrying cases, belt clips, or holders that do not have metal parts and that maintain at least 15 mm (5/8 inch) separation."

http://www.wifiinschools.org.uk/resources/safeschools2012.pdf

Studies on Learning Ability & RF/Microwave Exposure

The hippocampus

The brain's hippocampus plays a vital role in consolidating information from short-term memory to the long-term memory and in matters related to spatial navigation in both children and adults. Some RF/microwave regimes have been indicated as damaging it and also compromising its development. Animal tests by Salford et al. (2003) reported exposure to 915 MHz RF/microwave regimes from mobile phones for 2 hours produced highly significant ($p < 0.002$) evidence of neuronal damage in the hippocampus and other parts of the brain.

Memory function

Nittby et al. (2008) also investigated the possible effects of exposure to 900 MHz radiation on animals' cognitive functioning; 32 out of 56 rats (the rest being either sham exposed or controls) were exposed for 2 hours every week for 55 weeks to RF/microwave mobile phone radiation. After this protracted exposure, they were compared to sham exposed controls. The RF/microwave exposed animals exhibited impaired memory for objects and temporal order of presentation compared to the sham exposed controls ($p = 0.02$). Their results indicated significantly reduced memory functions occurred after 900 MHz RF/microwave exposures ($p = 0.02$).

Research by Fragopoulou et al. (2009) demonstrated that exposing test-animals for approximately 2 hours per day to 900 MHz RF/microwave radiation from a mobile for four days caused cognitive deficits in spatial learning and memory. In that study, the exposed animals were shown to be less proficient in transferring learned information to the following day, and exhibited deficits in consolidation and/or retrieval of learned information.

Narayanan et al. (2009), undertaking tests on 10-12 week old male rats, found exposing them to the 900/1800 MHz RF/microwave radiation of 50 missed calls a day from a mobile phone daily for 4 weeks induced behavioural changes, though the exact cause of these was undetermined. The animals exposed to RF/microwave radiation took longer to undertake tasks, had poorer spatial navigation and exhibited poorer memory function than those unexposed.

2.4 GHz exposures

Research undertaken by Wang & Lai & (2000) indicated that exposure to some 2.45 GHz RF/microwave regimes may affect memory. In that work, the long-term memory and navigational skills of rats appeared negatively influenced by one hour of exposure to 2.45 GHz radiation (pulse width 2ms, 500 pulses/s, average power density of 2,000 $\mu W/cm^2$) as compared to the unexposed control group. Whilst some studies by others failed to replicate this work (MMF 2005), the need for caution with regard to introducing exposures RF/microwave regimes is indicated.

A later study by Li et al. (2008), found exposing rats to a 2.45 GHz pulsed RF/microwave field at an average power density of 1,000 $\mu W/cm^2$ for 3 hours daily for up to 30 days resulted in significant deficits in spatial learning and memory performance in the exposed animals.

As a precautionary measure to improve health, wellbeing and learning ability in schools, it may prove prudent to introduce low field regimes wherever possible.

As noted by the U.S. President's Cancer Panel in its 2008-2009 report, "... *just as there are many opportunities for harmful environmental exposures, ample opportunities also exist to intervene in, ameliorate, and prevent environmental health hazards. Governments, industry, the academic and medical communities, and individuals all have untapped power to protect the health of current and future generations ... and reduce the national burden of cancer.*" (US DHSS 2010).

One of these international initiatives is the creation of Health Promoting Schools. This is an initiative that the UK can greatly contribute to.

Health Promoting Schools (HPS)

Schools, Wellbeing & Achievement

It is recognised by the UK Secretary of State for Education, the Right Honourable Michael Gove MP, that "… *the five outcomes for Every Child Matters… are: being healthy, staying safe, enjoying and achieving, making a positive contribution and securing economic well-being. As a statement of five things that we'd like for children - … They are unimpeachable …*" (Gove & Bell 2010).

This foresight is also shared by the UK's Directgov, "*Everyone in the education system must do what is sensible to keep pupils safe and healthy. This includes making the school environment as safe as possible*. ..." Directgov (2011). It therefore appears prudent, where possible, for the UK to minimise electromagnetic pollution in kindergartens, schools and colleges, and use wired alternatives to standard RF/microwave emitting technologies and other low cost/no cost mitigative measures where feasible.

The creation of environments that actively encourage wellbeing may also help contribute deliverables to Prime Minister David Cameron's groundbreaking National Well-being Debate initiative with parameters that might be easily assessed.

The presence or absence of environmental pollutants, such as electromagnetic pollution, may significantly impact on the learning and wellbeing of some individuals and reductions often be achieved at low or no cost. "*Healthy students learn better. The core business of a school is maximising learning outcomes. Effective Health Promoting Schools (HPS) make a major contribution to schools achieving their educational and social goals*." IUHPE (2010).

The essential elements required in HPS, as based on the WHO's Ottawa Charter for Health Promotion (WHO 1986), include having 'Healthy school policies' that are clearly defined in documents or accepted best practices which promote health and well-being; and that the school's physical environment (buildings, grounds and equipment) help promote health.

Another of the essential elements required in HPS is that potential environmental contaminants detrimental to health are addressed (IUHPE 2009).

The reduction of such potential stressors as electromagnetic pollution could be brought in through appropriate low cost/no cost 'best practice' legislation to help protect children. As noted by the UK Secretary of State for Education, when talking about child protection, "*It is critically important that we make some big changes early on and then allow change to be driven from within the system rather than from Whitehall*." (Gove & Bell 2010). Might introducing suitable legislation on electromagnetic hygiene initiatives to create Health Promoting Schools that encourage health, well-being and improved performance for current and future generations be one of the initiatives he champions?

The Parliamentary Assembly of the Council of Europe (PACE) recommends that the member states of the Council of Europe take "*all reasonable measures*" to reduce the exposure of children and young people to manmade electromagnetic fields to those that are 'As Low As Reasonably Achievable' (ALARA) and that preference should be given to adopting wired as opposed to wireless connections to reduce potential exposures (PACE 2011). The question is can the UK take the initiative and lead the way on this issue, or will another country?

> *"Systematic assessment of the health impact of a rapidly changing environment – particularly in areas of technology, work, energy production and urbanization - is essential."* WHO (1986).

"Pupil's education, health and wellbeing should be at the centre of any initiatives to introduce new technologies into schools. The technologies need to be adding value and need to be safe." WFIS (2011). It is proposed by the present author that introducing appropriate electromagnetic hygiene measures and legislation for schools could significantly benefit the UK and lead the way to improved scholastic performance, the development of new generations of 'bio-friendly' technology and increased National Well-being.

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Author biography: Email: isaac.jamieson@live.co.uk

Dr Isaac Jamieson is an independent scientist, architect and built environment consultant. He is presently a scientific advisor on stakeholder groups in the EU and UK involved in policy decisions for the creation of healthy environments at national and international level.

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http://www.radiationresearch.org/index.php?option=com_content&view=article&id=173

Appendix 5

Governmental Protection Against Radiation is in Conflict With Science

Professor Dr. Franz Adlkofer, MD.

There is no technology that made its way as quickly and as extensively into people's daily life like wireless communication. In only 30 years, the number of mobile phone users has world-wide increased from zero to about five billion. While the use of mobile phones is the result of people's free choice, their exposure to W-LAN and other wireless applications is mostly compulsory. Especially concerned are children in schools where this technology has been given preference to wired computers. Since our knowledge on possible adverse effects of radiofrequency electromagnetic fields is still rather poor, it is obvious that at present the biggest biophysical experiment of mankind is under way – with an uncertain outcome.

In May 2011, the uncertainty has been strengthened by the International Agency for Research on Cancer (IARC) that classified radiofrequency electromagnetic fields as 'possibly carcinogenic to humans'. This decision was mainly based on the results of epidemiological studies that observed after long-term (>10 years) and intensive use of mobile phones an increased risk for brain tumours exactly at the side of the head at which the mobile phone was used. The results from animal experiments, although of minor significance, supported the decision. Yet, results from basic research that showed changes in structure and functions of genes in isolated human and animal cells as well as in living animals after exposure and that would have given additional weight to the epidemiological observations were not taken into account. Had they been included in the evaluation, the classification would not have been 'possibly carcinogenic' but rather 'probably carcinogenic'.

The biggest dilemma is caused by the fact that the general public is confronted with two different views, one represented by politics and industry and one by the growing number of independent researchers. Ordinary people have either no idea of the probably adverse effects of radiofrequency radiation or have full confidence in the exposure limits that according to their governments reliably protect from any risk to the health. They do not know that the exposure limits are based on pseudo-science thought to create the necessary legal frame for a telecommunication industry that wants to make use of the new technology without being hampered by medical considerations. For this purpose, the exposure limits were based on physical deliberations solely accepting the existence of biological effects through temperature increase. The occurrence of biological effects far below the exposure limits, meanwhile demonstrated in numerous studies, was totally neglected. The human brain contains hundred billions of living cells, which operate and communicate with each other on the basis of electrochemical mechanisms. That these mechanisms can be deranged quite easily by electromagnetic fields has been shown many times by now. However, it is well known that

findings in conflict with industrial policies require decades of research and discussion until they are finally accepted.

For a medical doctor like me, the conclusion from the present state of knowledge must be that a precautionary approach is overdue and must not be delayed anymore.

As the organizer and coordinator of the EU funded REFLEX study carried out between 2000 and 2004 by 12 research groups from seven European countries, I had to realize that radiofrequency radiation far below the exposure limits owes - opposite to our expectations – a genotoxic potential, thus, contradicting the reliability of the current exposure limits. Our results are in line with those reported in many other scientific papers that in the meantime add up to more than 100. Up to now, all these findings are not considered in the radiation protection policy of most countries all over the world. Based on my experience gathered in more than 20 years of research in the area of electromagnetic fields, I came to the conclusion that institutional corruption is responsible (1) for the still miserable state of knowledge on biological effects of electromagnetic fields, and (2) for the blindness of most governments in regard of the growing set of data that cry out for the acceptance of the precautionary principle. The poor state of knowledge is due to selective funding of research by government and industry and the willingness of hired scientists to adjust their findings to the needs of the awarding authorities, while the governmental blindness is the result of lobbyism in the antechambers of political power (http://www.pandora-foundation.eu/downloads/harvard_23-03-2012_en.pdf). To those who are mostly affected by such an irresponsible attitude belong certainly our children. This is due to a higher susceptibility of juvenile tissue to radiofrequency radiation and – probably more important – to their high life expectancy that gives any tumour enough time to grow.

It remains to be seen how long the truth about the effects of radiofrequency radiation on the health of people can be suppressed by denying the facts. History teaches that early warnings are far too often followed by late insights for which a great number of people may have to pay with disease and premature death.