

David Jackson, Chair
Debra Rantz, Director of Education
Trustees: Elaine Crawford, Laurie French,
Wess Garrod, Tom Mahoney, Karen McGregor
Paula Murray, Alec Ross, Suzanne Ruttan

Dr. Anthony B. Miller
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Limestone District School Board
220 Portsmouth Avenue
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Via email and hardcopy

June 6, 2016

Re: Adverse Effects of Radiofrequency fields

Dear: Mr. Jackson, Ms. Rantz, Ms Crawford, Ms. French, Mr. Garrod, Mr. Mahoney, Ms. McGregor, Ms. Murray, Mr. Ross and Ms. Ruttan

I am writing to express my major concern over the increasing exposure of the population to Radiofrequency Fields (e.g. from wi-fi, as required for cell phones and iPads, and emitted by cell towers) and the lack of concern expressed by many governments and School Boards in Canada and the United States on this issue. In particular, justification for the “safety” of radiofrequency fields is placed upon the use of outdated safety standards, based upon tissue heating, whereas it has now been well demonstrated that adverse biological effects occur at far lower levels of radiofrequency fields that do not induce tissue heating, including a recent animal study performed by the National Toxicology Program in the United States which found an increased incidence of brain cancers and other cancers in rats exposed to prolonged Radiofrequency fields.

I am a physician and epidemiologist specializing in cancer etiology, prevention, and screening, an expert in epidemiology, and particularly causes of human cancer. I have performed research on ionizing radiation and cancer, electromagnetic fields and cancer, and have served on many committees assessing the carcinogenicity of various exposures, including working groups of the International Agency for Research on Cancer (IARC), widely regarded as providing unbiased assessment on the carcinogenicity of chemicals and other exposure to humans.

In 2011, an IARC working group designated radiofrequency fields as a class 2B carcinogen, a possible human carcinogen. Since that review a number of additional studies have been reported. One of the most important was a large case-control study in France, which found a doubling of risk of glioma, the most malignant form of brain cancer, after two years of exposure to cell phones. After five years exposure the risk was five-fold. They also found that in those who lived in urban environments the risk was

even higher. In my view, and that of several colleagues who have written papers with me on this issue, these studies provide evidence that radiofrequency fields are not just a possible human carcinogen but a probable human carcinogen, i.e. IARC category 2A. It would be impossible to ignore such an assessment in regulatory approaches.

It is important to recognize that there are no safe levels of exposure to human carcinogens. Risk increases with increasing intensity of exposure, and for many carcinogens, such as tobacco smoke, even more with increasing duration of exposure. Thus the only way to avoid the carcinogenic risk is to avoid exposure altogether. This is why we ban known carcinogens from the environment and why much effort is taken to get people, particularly young people, not to smoke. Indeed we now recognize that exposure to carcinogens in childhood can increase the risk of cancer in adulthood many years later. Further, people vary in their genetic makeup, and certain genes can make some people more susceptible than others to the effect of carcinogens. It is the young and those who are susceptible that safety codes should be designed to protect.

As an epidemiologist who has done a great deal of work on breast cancer, I have been concerned by a series of case reports from California and elsewhere of women who developed unusual breast cancers in the exact position where they kept cell phones in their bras. These are unusual cancers. They are multifocal, mirroring where the cell phone was kept. Thus in these relatively young women the radiofrequency radiation from the cell phone has caused breast cancer.

Not only brain and breast cancers but parotid gland tumors, tumors of the salivary gland, have been associated with prolonged exposure to cell phones. In Israel recently a study identified increasing risk of salivary gland tumors with increasing exposure to radiofrequency fields.

Given the long natural history of cancer and the fact that human populations have not been exposed for a sufficient length of time to reveal the full adverse effects of radiofrequency fields, it is extremely important to adopt a precautionary approach to the exposure of humans to such fields. An individual, if appropriately informed, can reduce her or his exposure to radiofrequency fields from devices that use wi-fi, but in the case of cell towers, smart meters and wi-fi in schools, the exposure they receive is outside their control. Then, with the people who manufacture these devices and those who promote wi-fi failing to issue adequate health warnings, we are reaching a situation where schools, work places and homes are being saturated with radiofrequency fields.

Thus to avoid a potential epidemic of cancer caused by radiofrequency fields from wi-fi and other devices, we should introduce means to reduce exposure as much as reasonably achievable, use hard wire connections to the internet and strengthen the codes that are meant to protect the public.

I should be pleased to provide a list of references if required.

Yours sincerely

A handwritten signature in black ink, appearing to read 'A. B. Miller'. The signature is fluid and cursive, with the first name 'A.' and last name 'Miller' clearly distinguishable.

Anthony B. Miller, MD, FRCP(C), FRCP, FACE

Professor Emeritus

Dalla Lana School of Public Health, University of Toronto, Ontario, Canada



Karolinska Institutet
Department of Neuroscience
Experimental Dermatology Unit

Stockholm, December 8, 2015

To:

MCPS CEO Dr. Andrew Zuckerman [Andrew_Zuckerman@mcpsmd.org]
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MCPS Chief Technology Officer Mr. Sherwin Collette [Sherwin_Collette@mcpsmd.org]
MCPS Board of Education [boe@mcpsmd.org]
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cc:

Montgomery County Council [county.council@montgomerycountymd.gov]

Dear Madame or Sir,

My name is Olle Johansson, and I am an associate professor, heading the Experimental Dermatology Unit at Sweden's Karolinska Institute in the Department of Neuroscience. I understand you have recently made public pronouncements regarding the safety of Wi-Fi. As a neuroscientist who has been studying the biophysical and epidemiological effects of electromagnetic fields (EMFs) for over 30 years, I believe this designation is short-sighted.

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 **non-ionizing radiation** 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. Whereas scientists can observe and reproduce these effects in controlled laboratory experiments, epidemiological and ecological data derived from long-term exposures in well-designed case-control studies reflect this link all the way from molecular and cellular effects to the living organism up to the induction and proliferation of diseases observed in humans. It should be noted that we are not the only species at jeopardy; practically all animals, plants and bacteria may be at stake. Although epidemiological and ecological investigations as such never demonstrate causative effects, due to the vast number of confounders, they confirm the relevance of the controlled observations in the laboratories.

Many times since the early 1980s I have pointed out that the public's usage of cell phones has become the largest full-scale biological and medical experiment ever with mankind, and I was also the first person to firmly point out that this involuntary exposure violates the Nuremberg Code's principles for human experimentation, which clearly states that voluntary

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consent of human subjects is absolutely essential. Among many effects seen, the very serious one is the deterioration of the genome. Such an effect - if seen in a food item under development or in a potential pharmaceutical drug - immediately would completely ban it from further marketing and sale; genotoxic effects are not to be allowed or spread. For these reasons above, we, scientists, can not accept that children undergo an enormous health risk for their present and future, by being exposed to WI-FI in kindergardens or schools (even if the WI-FI masts/routers are not in the children's classroom). The precautionary principle has to be respected. Furthermore, when men place cell phones in their front pocket, or laptops on their laps, it should be noted that experimental studies have demonstrated that after similar exposures there is a decrease in sperm count as well as in the quality of sperm, which is a phenomenon that could affect society's overall ability to procreate in the future. Experiments in mice point to that it may be true already in 5 generations time.

Many other states including France, Russia, Israel and Germany, have employed various precautionary steps and their responses (including labelling cell phones and other transmitting devices with SAR ratings, discouraging the use of cell phones and other wireless gadgets by children, warning parents of the risks, and removing or restricting WiFi in schools and replacing it with hard-wired ethernet) as a result of the *WHO/IARC classification of radiofrequency electromagnetic radiation in 2011 as a Class 2B carcinogen as well as the earlier classification of power-frequent magnetic fields in 2001 also as a Class 2B carcinogen*, the information summarized in the Bioinitiative Reports of 2007 and 2012, and the other considerable international and independent research and reviews, that show adverse biological effects from electromagnetic fields, including heart palpitations, headaches, skin rashes, damage to DNA, mental health effects, impaired concentration, decreased problem-solving capacity, electrohypersensitivity, etc., are about to set a new standard for educational quality with due respect to children's and staff's health.

In the case of "protection from exposure to electromagnetic fields", it is thus of paramount importance to act from a prudence avoidance/precautionary principle point of view. Anything else would be highly hazardous. Total transparency of information is the key sentence here, as I believe the public does not appreciate having the complete truth revealed years after a certain catastrophe already has taken place. For instance, it shall be noted, that today's recommended values for wireless systems, such as the SAR-values, are just recommendations, and not safety levels. Since scientists observe biological effects at as low as 20 microWatts/kg, can it truly be stated that it is safe to allow irradiation of humans at SAR 2 W/kg, or at 100,000 times stronger levels of radiation?

IMBALANCED REPORTING

Another misunderstanding is the use of scientific publications (as the tobacco industry did for many years) as 'weights' to balance each other. But one can NEVER balance a report showing a negative health effect with one showing no effect. This is a misunderstanding which, unfortunately, is very often used both by the industrial representatives as well as official authorities to the detriment of the general public. True balance would be reports showing negative health effects against *exact replications* showing no or positive effects. However, this is not what the public has been led to believe.

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NEED FOR INDEPENDENT RESEARCH

In many commentaries, debate articles and public lectures - for the last 20-30 years – I have urged that completely independent research projects must be inaugurated immediately to ensure our public health. These projects must be entirely independent of all types of commercial interests; public health can not have a price-tag! It is also of paramount importance that scientists involved in such projects must be free of any carrier considerations and that the funding needed is covered to 100%, not 99% or less. This is the clear responsibility of the democratically elected body of every country.

WHO/INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC), 2011

Very recently (in Lyon, France, May 31, 2011) the WHO/International Agency for Research on Cancer (IARC) has classified radiofrequency electromagnetic fields as possibly carcinogenic to humans (Group 2B), based on an increased risk for glioma, a malignant type of brain cancer. This should be added to the previous (2001) 2B classification of power-frequent (ELF) electromagnetic fields – emitted at high levels from handheld gadgets, such as eReaders and mobile phones – as a risk factor for childhood leukemia. Given the 2001 very close votes (9 to 11) for moving it to 2A and all the new knowledge that has accumulated since 2001, today the association between childhood leukemia and power-frequent (ELF) electromagnetic fields would definitely be signed into the much more serious 2A (“probably carcinogenic”) category. So, the ‘red flag’ is – unfortunately – flying very high.

INVOLUNTARY EXPOSURE

According to Article 24 of the UNICEF’s Child Convention “children have the right to ... a clean and safe environment, and information to help them stay healthy”. We must all ensure that this article never is violated. This is about our social responsibility, and is very much a public health issue.

In summary, electromagnetic fields may be among the most serious and overlooked health issues today, and having these fields checked and reduced/removed from schools and kindergardens may be essential for health protection and restoration, and is a must for persons with the functional impairment electrohypersensitivity as for children who are more fragile (cf. Belyaev I, Dean A, Eger H, Hubmann G, Jandrisovits R, Johansson O, Kern M, Kundi M, Lercher P, Mosgöller W, Moshammer H, Müller K, Oberfeld G, Ohnsorge P, Pelzmann P, Scheingraber C, Thill R, "EUROPAEM EMF Guideline 2015 for the prevention, diagnosis and treatment of EMF-related health problems and illnesses", Rev Environ Health 2015; 30: 337–371). In addition, as recently discussed in a think-tank group here in Stockholm, it is very important to constantly educate oneself and participate in the general debate and public discussions to keep the information build-up active. Thus, it is of paramount importance to keep the "kettle boiling", never blindly trusting or accepting given 'facts', but only read and think for yourself and for your loved ones. Only so you can arrive at a genuinely working precautionary principle.

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CONCLUSION

In conclusion, wireless systems, such as Wi-Fi routers or cell towers, and their electromagnetic fields, can not be regarded as safe in schools, but must be deemed highly hazardous and unsafe for the children as well as for the staff.

I encourage governments and local health and educational bodies to adopt a framework of guidelines for public and occupational EMF exposure that reflect the Precautionary Principle. As noted, the Precautionary Principle states when there are indications of possible adverse effects, though they remain uncertain, the risks from doing nothing may be far greater than the risks of taking action to control these exposures. The Precautionary Principle shifts the burden of proof from those suspecting a risk to those who discount it — as some nations have already done. Precautionary strategies should be based on design and performance standards and may not necessarily define numerical thresholds because such thresholds may erroneously be interpreted as levels below which no adverse effect can occur.

Some 100 years back, we learned the hard lessons of ionizing radiation and the need for strict health protections – now we must openly face the possibility that we must take a seat in life’s school and learn again. This time it is about non-ionizing radiation.

Based on all of the above, I strongly urge you to reconsider your public stance on the safety of Wi-Fi, cell towers, and similar systems in schools as their non-ionizing radiation emissions very likely are hazardous and unsafe for students, staff and teachers.

With my very best regards
Yours sincerely
Olle Johansson

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Martin Pall, PhD

August 7, 2017

Dear California Legislators,

I am Dr. Martin Pall, Professor Emeritus of Biochemistry and Basic Medical Sciences at Washington State University. I am a published and widely cited scientist on the biological effects of electromagnetic fields and speak internationally on this topic. I am particularly expert in how wireless radiation impacts the electrical systems in our bodies. I have published 7 studies showing there exists exquisite sensitivity to electromagnetic fields (EMFs) in the voltage sensor in each cell, such that the force impacting our cells at the voltage sensor has massive impact on the biology on the cells of our bodies [1-7]. These papers are discussed in over 360,000 web sites which can be easily found by Googling (Martin Pall electromagnetic). I received my PhD at Caltech, one of the top scientific institutions in the world.

EMFs act by activating channels in the membrane that surrounds each of our cells, called voltage-gated calcium channels (VGCCs). The EMFs put forces on the voltage sensor that controls the VGCCs of about 7.2 million times greater than the forces on other charged groups in our cells [4,6,7]. This is why weak EMFs have such large biological effects on the cells of our bodies! EMFs works this way not only on human and diverse animal cells [1-7] but also in plant cells [7] so that this is a universal or near universal mechanism of action.

Thousands of published studies show biological and health effects from electromagnetic fields. We now know the mechanism that can explain these effects. The mechanism is a function of the electromagnetics of each cell—not solely about heating effects from the radiation (on which present FCC guidelines are based).

This new understanding [1-7] means we can debunk the claims of the wireless industry that there cannot be a mechanism for effects produced by these weak EMFs. The 20 years plus of industry propaganda claims are false. Rather the thousands of studies showing diverse health impacts of these EMFs can be explained. We now have a mechanism, one that is supported by both the biology and the physics, both of which are pointing in exactly the same direction. I am sending as a separate document a list of 134 reviews, each of which provides from 12 to over a thousand individual citations showing health impacts of low intensity EMFs, EMFs that the telecommunications industry claims cannot have such effects. **These 134 reviews and thousands of primary scientific papers they cite show that the industry propaganda has no scientific support whatsoever.**

The consensus among independent scientists on this is further confirmed by the 2015 (and later) appeal made to the United Nations and member states, stating that the current EMF safety guidelines are inadequate because they do not take into consideration non-thermal effects. This was signed by 225 scientists from 41 countries, each of whom had

published peer reviewed studies on EMF health effects – a total of 2,000 papers published in this area by the signers, a substantial fraction of the total publications in this area.

According to industry, the forces electromagnetic fields place on electrically-charged groups in the cell are too weak to produce biological effects. However, the unique structural properties of the voltage-gated calcium channel (VGCC) protein can, it turns out, explain why the force on a cell's voltage sensor from low-intensity EMFs are millions of times stronger than are the forces on singly-charged groups elsewhere in the cell.

It would be a disaster for the health of Californians to be exposed to the antennas envisioned in SB.649. The State of California would be making a grave mistake to proceed with supporting the commercial interests of the wireless industry with this legislation. **Legislators would best pause to understand the gravity of the biological effects, and the ramifications for physical and mental health, as well as consequences from continual damage to human DNA, and learn the facts from scientists who are independent of the wireless industry, not from the industry lobbyists who have a gigantic conflict of interest.**

VGCC activation in cells produced by low intensity EMFs can explain long-reported findings that electromagnetic fields and a wide range of biological changes and health effects. The first 6 of these (see below) were well documented 46 years ago in the U.S. Office of Naval Medical Research report, published in 1971 [8]. The others that follow have been extensively documented subsequently in the peer-reviewed scientific literature:

- 1) Various neurological/neuropsychiatric effects, including changes in brain structure and function, changes in various types of psychological responses and changes in behavior.
- 2) At least eight different endocrine (hormonal) effects.
- 3) Cardiac effects influencing the electrical control of the heart, including changes in ECGs, producing arrhythmias, changes that can be life threatening.
- 4) Chromosome breaks and other changes in chromosome structure.
- 5) Histological changes in the testes.
- 6) Cell death (what is now called apoptosis, a process important in neurodegenerative diseases).
- 7) Lowered male fertility including lowered sperm quality and function and also lowered female fertility (less studied).
- 8) Oxidative stress.
- 9) Changes in calcium fluxes and calcium signaling.
- 10) Cellular DNA damage including single strand breaks and double strand breaks in cellular DNA and also 8-OHdG in cellular DNA.
- 11) Cancer which is likely to involve these DNA changes but also increased rates of tumor promotion-like events.
- 12) Therapeutic effects including stimulation of bone growth.
- 13) Cataract formation (previously thought to be thermal, now known not to be).
- 14) Breakdown of the blood-brain barrier.
- 15) Melatonin depletion and sleep disruption.

They may be low intensity but with regard to the VGCCs, electromagnetic fields can have a tremendously powerful impact on the cells of our bodies. Furthermore, published studies showing that calcium channel blocker drugs block or greatly lower biological effects from electromagnetic fields confirm there is a VGCC activation mechanism that is causing various effects. Higher frequency electromagnetic fields from 5G technologies on the horizon pose even greater biological concern than those to which we are exposed today. We should be moving, instead, to wired technologies at every opportunity, based on what we know in science today, not expanding and supporting the proliferation of wireless.

I want to make several additional points very clear:

1. The Physics and the Biology are both pointing in the same direction. Both show that EMFs act primarily via activating the VGCCs in the cells of our bodies.
2. DNA damage known to be produced by these EMFs occur in human sperm and may also occur in human eggs, leading to large increases in mutation in any children born. It is thought that an increase in mutation frequency of 2.5 to 3-fold will lead to extinction because of accumulation of large numbers of damaging mutations. We may already be over this level, and if so, simply continuing our current exposures will lead to eventual extinction. Further increases in exposures will be more rapidly self-destructive.
3. Pulsed EMFs are, in most cases, more biologically active and therefore more dangerous than are non-pulsed (continuous wave) EMFs. All cordless communication devices communicate via pulsations, because it is the pulsations that carry the information communicated. All the industry claims of safety are based on a theory (only thermal effects) that was known to be wrong back in 1971 [8] – and that was before many thousands of additional studies were published providing massive confirmation that industry claims are false.
4. The industry is trying to move to much higher frequencies because these much higher frequencies allow much higher pulsations and therefore much higher transmission of information. However, these higher pulsation rates make these ultra-high devices vastly more dangerous. This is part of the reasons why it is so important to vote down SB.649.
5. None of our wireless communication devices are ever tested biologically for safety – not cell phone towers, not cell phones, not Wi-Fi, not cordless phones, not smart meters and certainly not 5G phones, or radar units in cars – before they are put out to irradiate an unsuspecting public.
6. The telecommunications industry has corrupted the agencies that are supposed to be regulating them. The best example of this is that the FCC which regulates EMFs in the U.S. is a “captured agency”, captured by the industry it is supposed to regulate, according to an 8 chapter document published by the Edmond J. Safra Center for Ethics at Harvard University [9]. Is it any wonder, therefore, that the industry keeps touting that their devices are within the safety guidelines set by the FCC?

I urge you to do the right thing on behalf of the health of Californians and future generations. Please let me know if I can provide further information. (503) 232-3883.

Sincerely,

Martin Pall, PhD (Caltech, 1968)

Professor Emeritus of Biochemistry and Basic Medical Sciences

Washington State University

Citations:

1. Pall ML. 2013 Electromagnetic fields act via activation of voltage-gated calcium channels to produce beneficial or adverse effects. *J Cell Mol Med* 17:958-965.
2. Pall ML. 2014 Electromagnetic field activation of voltage-gated calcium channels: role in therapeutic effects. *Electromagn Biol Med*. 2014 Apr 8.
3. Pall ML. 2015 Scientific evidence contradicts findings and assumptions of Canadian Safety Panel 6: microwaves act through voltage-gated calcium channel activation to induce biological impacts at non-thermal levels, supporting a paradigm shift for microwave/lower frequency electromagnetic field action. *Rev Environ Health* 30:99-116.
4. Pall ML. 2015 Elektromagnetische Felder wirken über die Aktivierung spannungsabhängiger Calciumkanäle, um günstige oder ungünstige Wirkungen zu erzeugen. *Umwelt-Medizin-Gesellschaft* 28: 22-31.
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6. Pall ML. 2016 Microwave frequency electromagnetic fields (EMFs) produce widespread neuropsychiatric effects including depression. *J Chem Neuroanat* 75(Pt B):43-51. doi: 10.1016/j.jchemneu.2015.08.001. Epub 2015 Aug 21.
7. Pall ML. 2016 Electromagnetic fields act similarly in plants as in animals: Probable activation of calcium channels via their voltage sensor. *Curr Chem Biol* 10: 74-82.
8. Naval Medical Research Institute Research Report, June 1971. Bibliography of Reported Biological Phenomena ("Effects") and Clinical Manifestations, Revised, ZR Glaser.
9. *Captured Agency: How the Federal Communications Commission Is Dominated by the Industries It Presumably Regulates*, by Norm Alster. Published by Edmond J. Safra Center for Ethics, Harvard University. An e-book under the Creative Commons 4.0 License: <https://creativecommons.org/licenses/by/4.0/>



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August 18, 2017

To whom it may concern,

I urge in the strongest terms that you vigorously oppose California SB 649.

If this bill passes, many people will suffer greatly, and needlessly, as a direct result.

This sounds like hyperbole. It is not.

My research group at UC San Diego alone has received hundreds of communications from people who have developed serious health problems from electromagnetic radiation, following introduction of new technologies. Others with whom I am in communication, have independently received hundreds of similar reports. Most likely these are a tip of an iceberg of tens or perhaps hundreds of thousands of affected person. As each new technology leading to further exposure to electromagnetic radiation is introduced – and particularly introduced in a fashion that prevents vulnerable individuals from avoiding it – a new group become sensitized to health effects. This is particularly true for pulsed signals in the radiowave and microwave portion of the spectrum, the type for which the proposed bill SB 640 will bypass local control.

Mechanisms by which health effects are exerted have been shown to include oxidative stress (the type of injury against which antioxidants protect, see optional section below), damage to mitochondria (the energy producing parts of cells), damage to cell membranes^{1,21}, and via these mechanisms, an impaired “blood brain barrier”³⁻⁵ (the blood brain barrier defends the brain against introduction of foreign substances and toxins; additionally, disruption can lead to brain edema⁶), constriction of blood vessels and impaired blood flow to the brain⁷, and triggering of autoimmune reactions^{8,9}. Following a large exposure, that depresses antioxidant defenses, magnifying vulnerability to future exposures, some persons no longer tolerate many other forms and intensities of electromagnetic radiation that previously caused them no problem, and that currently cause others no problem. But this group deserves – nay needs -- the right to be able to avoid these exposures.

Affected individuals not only experience “symptoms” that “merely” cause them distress and suffering, when they are exposed – symptoms like headaches^{10,11}, ringing ears^{10,11} and chest pain¹⁰ from impaired blood flow, heart rhythm abnormalities^{10,11}, and inability to sleep^{10,11}. These symptoms arise from physiological injury. Moreover, **many experience significant health problems that can include seizures¹¹, heart failure, hearing loss¹²⁻¹⁴ and severe cognitive impairment^{11,15}**. The mechanisms involved are those also involved in development and progression of neurodegenerative conditions including Alzheimer’s disease¹⁶.



Fully half who were employed when their problems developed lost their job because of the problem, among participants of a survey we conducted. They reported that their condition had cost them up to 2 million dollars to date. Many had lost their homes. A number became homeless, and have swelled the ranks of so-called “EMF refugees”¹⁷⁻¹⁹. Among those affected, many were previously high functioning individuals – engineers, doctors, lawyers. The best and the brightest are among those whose lives – and ability to contribute to society – will be destroyed. High profile individuals with acknowledged electrohypersensitivity include, for instance, Gro Harlem Brundtland – the former 3-time Prime Minister of Norway and former Director General of the World Health Organization²⁰; Matti Niemela, former Nokia Technology chief²¹; as well as the wife of Frank Clegg²², who formerly headed Microsoft Canada and is current head of Canadians for Safe Technology²³.

Each new roll-out of electromagnetic technology for which exposure is obligatory, swells the ranks of those who develop problems with electromagnetic fields (EMF).- particularly following a significant exposure to pulsed radiowave-microwave radiation, and particularly when people have no ability to avoid it.

Many state that they didn’t give credence to the problem (if they had heard of it at all) **until they themselves fell prey to it.**

This is not a psychologically driven condition. Multiple objective physiological changes reflecting mechanisms of injury have been shown in persons with this condition^{24, 25}.

The role for oxidative stress, that has been shown in innumerable studies (below), **is affirmed by evidence of a link of this condition to genetic variants in antioxidant defenses,** that are less avid in defending against oxidative stress³⁰⁷. People cannot manipulate their genes, to produce such an outcome by suggestibility.

An analysis by a University of Washington researcher showed that most studies funded by industry reported failure to show physiological effects. However, most studies without such industry bias affirmed effects. This is redolent of findings shown in medicine²⁶, regarding which the former editor in chief of the BMJ (the British Medical Journal), Richard Smith, noted, based on findings of a study, “This {result} suggests that, far from conflict of interest being unimportant in the objective and pure world of science where method and the quality of data is everything, it is the main factor determining the result of studies.”²⁷. So where articles deny injury from nonionizing radiowave-microwave radiation, there is commonly a stake aligned with financial benefit from such denial.

Those who are affected are in desperate need of protection by our elected officials. They need creation of safe spaces and housing, and roadways to allow travel, not removal of any prospect of one; protection of local rights to make decisions - **not removal of any recourse or ability to avoid what injures them.** They are far more strongly in need of protections than a great many protected classes – their problems arose due to actions of others, against which they were given no control – *and can be reversed*, in most cases, if the assault on them is rolled back. Through no fault of their own, and in some cases against their will (e.g. before opt out was permitted with smart meters), they were subjected to an



exposure that has altered their lives as they knew them, and forced them – needlessly - to the margins of society.

Let our focus be on safer, wired and well shielded technology – not more wireless.

This legislation, if passed, and the resulting unrestricted roll-out of this technology, will predictably and directly injure and disable a new group, and add depth of suffering to those already affected.

In other spheres we abridge freedoms to protect the vulnerable few. We require that every schoolchild be vaccinated, supposedly to protect the vulnerable few who may not respond effectively to a vaccine. The need to protect the vulnerable group is deemed to be so great that it justifies the decision to abridge individual rights.

In contrast, this bill seeks to abridge individual freedoms, and local rights, in the service of *harming* a vulnerable group, and creating a new one.

(The common factor appears to be that in both cases, the direction is aligned with a powerful industry that influences political decisions.)

Luckily, no abridgment of individual rights and freedoms is required to protect, here.

If any group can opt out (such as, I understand, firefighters*)²⁸; **then every group deserves that equal right.** Others should not be second class citizens, subject to fewer protections.

It would go far to helping this cause if anyone complicit in promoting or passing the legislation (and then after that, *their* families) were required to be the first subjected, for a substantial test period, to the *greatest* amount of exposure that anyone *else* (and their families) may be subjected to, when new policies of this type are rolled out. It will still not do them equal damage; because they may not represent the vulnerabilities that others will have; but such a policy might help them to think twice. *That* is a bill I would strongly endorse.

Most who are now affected – were not, until they were. This may become you – or your child or grandchild. Moreover, if you have a child, or a grandchild, his sperm, or her eggs (all of which she will already have by the time she is a fetus in utero), will be affected by the oxidative stress damage created by the electromagnetic radiation, in a fashion that may affect your future generations irreparably.

It was noted above that, among survey completers, fully half of those who were employed at the time they developed electrosensitivity, lost employment *due to* this problem. (This may understate the scope of the tragedy, since this most-affected group may be least likely to be able to respond to an online survey.) **Many who previously had no problem navigating in the world are now restricted from access to basic services** like hospital care, post offices and libraries because of these problems. With each new introduction of technology that exposes many to yet a new nondiscretionary source of electromagnetic radiation, particularly (but not exclusively) that which emits pulsed radiation in the radiowave-microwave part of the spectrum, a new group of people are affected; and the suffering of those who are already affected increases greatly.



Please, defend the public and our future. Protect the rights of the individual and the locality, against a form of incursion that will lead to serious harm to some – and set a terrible precedent. **Vote no on California SB 649**, and urge that everyone else do the same.

Sincerely,

Beatrice Alexandra Golomb, MD, PhD
 Professor of Medicine
 UC San Diego School of Medicine

*Comment on the fire fighter exemption: “The legislature granted an exemption from SB 649 to the firefighters who requested it for health reasons. Throughout California firefighters have long complained of often disabling symptoms from cell towers on their stations. Cities frequently rent out space on fire stations to add to city revenue. ... Symptoms experienced by the firefighters have included neurological impairment including severe headache, confusion, inability to focus, lethargy, inability to sleep, and inability to wake up for 911 emergency calls. Firefighters have reported getting lost on 911 calls in the same community they grew up in, and one veteran medic forgot where he was in the midst of basic CPR on a cardiac victim and couldn’t recall how to start the procedure over again... Prior to the installation of the tower on his station, this medic had not made a single mistake in 20 years. A pilot study (2004) of California firefighters showed brain abnormalities, cognitive impairment, delayed reaction time, and lack of impulse control in all 6 firefighters tested (<https://ecfsapi.fcc.gov/file/7022117660.pdf>). This study led to the overwhelming passage of Resolution 15 by the International Association of Firefighters in Boston in August 2004. Res. 15 called for further study and was amended to impose a moratorium on the placement of cell towers on fire stations throughout the US and Canada.”^{15 28}
 Clearly, others who experience similar problems also deserve protections.

Optional – More on the Science

There is a robust literature showing that electromagnetic radiation, including in nonionizing frequencies, and at levels^{29,30} below those that are cause thermal effects (heating) – causes physiological effects, injury, and cell death –not only in humans but many animals and plants^{3, 7, 31-49}. Unsurprisingly, industry has sought – against the tide of evidence to the contrary - to maintain that radiation must be ionizing or heating to cause injury.

Scores or hundreds of studies show that radiation, including specifically radiowave-microwave spectrum radiation, and including low-level exposure, can impair antioxidant defenses, increase “oxidative stress” (free radical injury) and damage mitochondria, the energy producing parts of cells^{1, 2, 34, 50-6930, 70-104105-13646, 137-171}. These effects occur with ionizing and nonionizing radiation, at thermal and subthermal levels. (Indeed, much or most of the damage by ionizing radiation, and radiation above the thermal limit, occurs by mechanisms also documented to occur without ionization, and below the thermal limit.) These



mechanisms cohere with the mechanisms documented to play a role in symptoms and health conditions that are reported in those who are electrosensitive – extending to seizures¹⁷²⁻¹⁷⁶, heart failure¹⁷⁷⁻¹⁸⁴ and cognitive decline^{5, 32, 57, 108, 185-195}.

These mechanisms have known involvement in induction of brain cancer, metabolic diseases like obesity and diabetes, autism, autoimmune disease, and neurodegenerative conditions, conditions that have exploded. In each case these have been linked, or presumptively linked, in some studies to electromagnetic radiation^{8, 9, 16, 34, 196-219}.

Such radiation also has effects on sperm^{33, 100, 220-228}; and the DNA of sperm²²⁹ (consistent with recent news reports of marked recent declines in sperm counts and function)..

Such radiation also has toxic effects in pregnancy²³⁰, to the fetus and subsequent offspring²³¹⁻²³⁵ including at low levels²³⁶, and is tied to developmental problems in later life, including attention deficit and hyperactivity^{31, 235-241}. It is critical to defend pregnant women (and eggs of girls who may at a later time become pregnant) from exposures with such toxicity.

Electromagnetic radiation across much or most of the spectrum (not excluding visible light) has been shown to depress levels of melatonin^{40, 72, 242-252}, which is best known for its role in sleep (and indeed, impaired sleep is the most consistent symptom in affected individuals^{10, 11}).

Melatonin is in fact a critical antioxidant that defends the body against harm from many toxic exposures²⁵³⁻²⁶⁶ including electromagnetic radiation itself^{61, 66, 67, 82, 101, 107, 118, 121, 138, 144, 151, 204, 249, 267-284} - reducing the oxidative stress that is implicated in cancer, metabolic diseases like obesity and diabetes, autism, autoimmune disease, bipolar disorder and neurodegenerative conditions, and that also plays a role in heart attack and stroke^{9, 285-329330-343}.

Radiation, and specifically radiation in the radiowave-microwave portion of the spectrum can also depress levels of other critical antioxidant systems that also defend the body against chemical, radiation, and other sources of injury. These other antioxidant systems include the glutathione system, superoxide dismutase and catalase^{81, 102, 115, 116, 233, 344-358} - which are also involved in defending against health problems.

This suggests that depression of antioxidant defenses due to electromagnetic radiation may magnify risk of chemically induced health effects (and depression of antioxidant systems due to some chemicals may amplify risk of harm from electromagnetic radiation). Indeed just such effects have been reported^{359, 360}.



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June 28, 2017

The Honorable Cecilia Aguiar-Curry
Chair of the Local Government Committee
1020 N Street, Room 157
Sacramento, CA 95814

RE: SB 649 (Hueso) – Small Cell Wireless Facilities — OPPOSE

Dear Chair Aguiar-Curry:

As a nonprofit research and policy organization dedicated to identifying and reducing environmental health hazards, Environmental Health Trust (EHT) writes to advise you of serious scientific grounds to reject SB 649 as advanced by Senator Hueso. I have personally served as an expert advisor to the California Department of Health as well as the San Francisco and Berkeley City governments on matters relevant to this bill. EHT has been honored to work with California government and scientists for over a decade. At the invitation of the Israel Institute for Advanced Study of the Hebrew University of Jerusalem, EHT recently organized and chaired an [Expert Forum on Wireless Radiation and Health](#), bringing together scientists and engineers from more than ten high tech nations. Reflecting these efforts, EHT provides independent scientific research and advice on avoidable environmental health hazards to local, state and national governments.

SB 649 will pave the way for widespread introduction of 5G microwave wireless radiation frequency (RF) that has never been tested for its impact of public health or the environment. Other RF microwave radiation such as that used by cellphones and other wireless devices has been [classified as a 'possible carcinogen'](#) by the International Agency for Research on Cancer in 2011 and more recently dubbed a ['probable carcinogen.'](#) by expert researchers looking at newer information in 2015.^{1,2,3} In addition, this bill could result in the loss of hundreds of millions of dollars in local revenue, as the [San Francisco Chronicle noted](#) today.

By ignoring growing scientific evidence of harm, the bill effectively will ensure the widespread exposures of millions of Californians to an agent that growing numbers of scientists and nations consider a serious

¹ World Health Organization. ["IARC classifies radiofrequency electromagnetic fields as possibly carcinogenic to humans."](#) WHO, Press Release, no. 208, 2011.

² IARC Working Group on the Evaluation of Carcinogenic Risks to Humans. ["Non-ionizing radiation, Part 2: Radiofrequency electromagnetic fields."](#) *IARC Monographs On The Evaluation of Carcinogenic Risks to Humans*, vol. 102, pt. 2, 2013.

³ Morgan, L. Lloyd, et al. ["Mobile phone radiation causes brain tumors and should be classified as a probable human carcinogen \(2A\)."](#) *International Journal of Oncology*, vol. 46, no. 5, 2015, 1865-71.

health threat. Recently, studies have found that the frequencies which will be used in 5G and other future technologies can have harmful effects⁴, as Dr. Cindy Russell, Vice President of Community Health for the Santa Clara Medical Association noted.⁵ As articulated in their state Constitution, California cities and counties have a duty to protect the health and safety of their residents.

EHT has a longstanding history of research and policy advice to state, local and national governments regarding strategies to reduce disease and promote health by avoiding environmental health hazards. Our organization opposes the broad scale installation of untested wireless antennas and associated electrical equipment close to humans and through critical wildlife habitat and corridors. Both federal and local zoning controls are needed to assure that cellular equipment are installed to avoid significant and serious safety threats of electrical shock, fire, and radio frequency (RF) microwave radiation exposures, as well as chronic impacts on public health and the environment.

Consistent with public health concepts of preventing harm by reducing exposure to suspected carcinogens, EHT opposes the usurpation and preemption of local authority that will allow federal and state authorities to place what state reports of the bill indicate can be thirty thousand new radiating 5G cell antennas on city and county utility, light poles, and other right of ways in close proximity to city and county workers, children, residents and visitors. In some cases towers will need to be sited every 100 feet with antennas at a height of 30 feet or less. Local authority and duty should not be overridden by preemptive federal or state policies such as SB 649 which disregards scientific evidence on this matter as outlined below.

Regarding potential health risks from RF a number of corporations advise their shareholders that they face serious risks from RF. For instance, Crown Castle's [2016 10-K ANNUAL REPORT](#), states that,

"If radio frequency emissions from wireless handsets or equipment on our wireless infrastructure are demonstrated to cause negative health effects, potential future claims could adversely affect our operations, costs or revenues. The potential connection between radio frequency emissions and certain negative health effects, including some forms of cancer, has been the subject of substantial study by the scientific community in recent years. We cannot guarantee that claims relating to radio frequency emissions will not arise in the future or that the results of such studies will not be adverse to us...If a connection between radio frequency emissions and possible negative health effects were established, our operations, costs, or revenues may be materially and adversely affected. We currently do not maintain any significant insurance with respect to these matters."

Most wireless companies from [AT&T](#) to [Nokia](#) to [T Mobile](#) to [Verizon Wireless](#) have issued [similar warnings](#) to their shareholders.

Regarding public health impacts, recently released research findings from the premiere test program of the National Institute of Environmental Health Sciences (NIEHS) add to the body of scientific evidence

⁴ Feldman, Yuri, et al. "[Human Skin as Arrays of Helical Antennas in the Millimeter and Submillimeter Wave Range.](#)" *Physical Review Letters*, vol. 100, no. 128102, 2008.

⁵ Russell, Cindy. "[A 5G Wireless Future: Will it give us a Smart Nation or Contribute to an Unhealthy One?](#)" Santa Clara Bulletin, Jan./Feb. 2017.

indicating that RF microwave radiation can be harmful. The 10 year \$25 million NIEHS National Toxicology Program's [Studies of the Toxicology and Carcinogenicity Cell Phone Radiation](#) reports that RF produced increases rates of highly malignant very rare tumors: gliomas of the brain and schwannomas of the heart.⁶ These experimental findings are consistent with human studies showing increased rates of gliomas and acoustic neuromas (schwann cells) among humans exposed to cell phone radiation. In addition to increased cancers, the NTP study also reported that prenatally exposed animals produced offspring with lower birth weight and [evidence of direct genetic damage](#).

Since the 2011 WHO/IARC classification, the peer reviewed research connecting microwave exposure to cancer has significantly strengthened. In [2015, a study](#) replicated a 2010 [experiment](#) that found that weak cell phone signals significantly promote the growth of tumors in mice, and that toxic chemical exposures combine with RF to more than double the tumor response.^{7,8} The Ramazzini Institute is engaged in similar research with RF that is 1000 less than the NTP exposures—set to mimic radiation exposure levels caused by network equipment (e.g., cell tower antenna emissions).

Consistent with the [NTP findings](#), the Ramazzini Institute team [report](#) significantly lower litter weights, as presented at the January 2017 [Conference on Wireless and Health](#) at Israel Institute for Advanced Study, Hebrew University of Jerusalem.⁹ Findings of effects at such low levels is indication of the capability of low level electromagnetic radiation exposure to result in biological effects.

Other studies finding serious increased risk of glioma in regular cell phone users are of special relevance. In 2014, a [French national study](#) linked higher cell phone exposure to increased glioma in cell phone users.¹⁰ A newly published research [report](#) in the *American Journal of Epidemiology* finds that Canadians who have used cell phones for 558 hours or more have more than a doubled risk of brain cancer.¹¹ Previous [published re-analysis](#) of the multi country Interphone study data has found stronger positive associations to glioma risk among long term users and heavy users and a [statistically significant](#) association between where tumors were located and how much radiation an individual received from their phone.^{12,13}

⁶ Wyde, Michael, et al. "[Report of Partial findings from the National Toxicology Program Carcinogenesis Studies of Cell Phone Radiofrequency Radiation in Hsd: Sprague Dawley® SD rats \(Whole Body Exposure\)](#)." *bioRxiv*, no. 055699, 2016.

⁷ Lerchl, Alexander, et al. "[Tumor promotion by exposure to radiofrequency electromagnetic fields below exposure limits for humans](#)." *Biochemical and Biophysical Research Communications*, vol. 459, no. 4, 2015, pp. 585-90.

⁸ Tillmann, Thomas, et al. "[Indication of cocarcinogenic potential of chronic UMTS-modulated radiofrequency exposure in an ethylnitrosourea mouse model](#)." *International Journal of Radiation Biology*, vol. 86, no. 7, 2010, pp. 529-41.

⁹ Belpoggi, Fiorella. "[Recent findings on wireless radiation and health from the Ramazzini Institute could reinforce the NTP results](#)." *Conference on Wireless and Health*, 2017.

¹⁰ Coureau, Gaëlle, et al. "[Mobile phone use and brain tumours in the CERENAT case-control study](#)." *Occupational Environmental Medicine*, vol. 71, no. 7, 2014, pp. 514-22.

¹¹ Momoli, F., et al. "[Probabilistic multiple-bias modelling applied to the Canadian data from the INTERPHONE study of mobile phone use and risk of glioma, meningioma, acoustic neuroma, and parotid gland tumors](#)." *American Journal of Epidemiology*, 2017.

¹² Turner, Michelle C., et al. "[Investigation of bias related to differences between case and control interview dates in five INTERPHONE countries](#)." *Annals of Epidemiology*, vol. 26, 12, 2016, pp. 827-32.

More recently, research carried out by physicists in Israel and others have shown that the higher millimeter wave frequencies to be used in 5G applications uniquely interacts with sweat ducts of the human skin which can then function as antennas to amplify signals. This work extends studies first produced in 1986.¹⁴ The potential long-term impact of such stimulation on precancerous skin growths should be evaluated carefully, including potential super-growth of bacteria.¹⁵ A [lecture](#) by Paul Ben-Ishai, PhD, and published research on this issue can be found on the [2017 Conference website](#).^{16, 17, 18}

Cancer is not the only health concern presented by wireless devices and infrastructure. Impacts on [reproduction](#) and [brain development](#) have also been repeatedly reported in the peer reviewed literature in addition to a myriad of other adverse effects.^{19, 20, 21, 22}

In light of these developments showing growing evidence of the biological impact of RF, it is imperative that new infrastructure and 5G not be introduced widely into commerce at this time. The State of California needs to critically consider the potential impact of massive new and possibly carcinogenic wireless exposures to their population. Before introducing additional untested wireless technology into the environment, it is necessary to:

- model exposures to infants, children and pregnant women;
- conduct experimental tests on exposures' impacts on wildlife; and
- evaluate impacts on human systems through in vitro and in vivo toxicology

In 2015, the [International EMF Scientist Appeal](#), now signed by over 225 scientists from 41 nations, was submitted to the Secretary-General of the United Nations, the Director-General of the World Health Organization and U.N. Member Nations urging the development of more protective guidelines for EMF (including RF-EMF), encouraging precautionary measures, and calling for education of the public about

¹³ Grell, Kathrine, et al. ["The intracranial distribution of gliomas in relation to exposure from mobile phones: analyses from the INTERPHONE study."](#) *American Journal of Epidemiology*, vol. 184, no. 11, 2016, pp. 818-28.

¹⁴ Gandhi OP, Riaz A. ["Absorption of millimeter waves by human beings and its biological implications."](#) *IEEE Transactions on Microwave Theory and Techniques*, vol. 34, no. 2, 1986, pp. 228-235.

¹⁵ Soghomonyan D, K. Trchounian and A. Trchounian. ["Millimeter waves or extremely high frequency electromagnetic fields in the environment: what are their effects on bacteria?"](#) *Applied Microbiology and Biotechnology*, vol. 100, no. 11, 2016, pp. 4761-71.

¹⁶ Feldman, Yuri and Paul Ben-Ishai. ["Potential Risks to Human Health Originating from Future Sub-MM Communication Systems."](#) *Conference on Wireless and Health*, 2017.

¹⁷ Hayut, Itai, Paul Ben Ishai, Aharon J. Agranat and Yuri Feldman. ["Circular polarization induced by the three-dimensional chiral structure of human sweat ducts."](#) *Physical Review E*, vol. 89, no. 042715, 2014.

¹⁸ Feldman, Yuri, et al. ["Human Skin as Arrays of Helical Antennas in the Millimeter and Submillimeter Wave Range."](#) *Physical Review Letters*, vol. 100, no. 128102, 2008.

¹⁹ Adams, Jessica A., et al. ["Effect of mobile telephones on sperm quality: a systematic review and meta-analysis."](#) *Environment International*, 70, 2014, pp. 106-112.

²⁰ Deshmukh, P.S., et al. ["Cognitive impairment and neurogenotoxic effects in rats exposed to low-intensity microwave radiation."](#) *International Journal of Toxicology*, vol. 34, no. 3, 2015, pp. 284-90.

²¹ Aldad, T.S., et al. ["Fetal Radiofrequency Radiation Exposure From 800-1900 MHz-Rated Cellular Telephones Affects Neurodevelopment and Behavior in Mice."](#) *Scientific Reports*, vol. 2, no. 312, 2012.

²² Sonmez, O.F., et al. ["Purkinje cell number decreases in the adult female rat cerebellum following exposure to 900 MHz electromagnetic field."](#) *Brain Research*, vol. 1356, 2010, pp. 95-101.

health risks, particularly risks to children and fetal development.²³ Most recently, the EMF Scientists have submitted [Comments to the FCC](#) asking the FCC to critically consider the potential impact of the 5th generation wireless infrastructure on the health and safety of the U.S. population before proceeding to deploy this infrastructure.

California firefighters have lobbied to protect themselves and successfully received exemption on health grounds from the installation of these cell towers. Similarly cities and counties should be given the needed local controls to protect their citizens from the health and safety risks of these installations. As currently envisioned, transmitters can be placed in close proximity to bedrooms and schools without consideration of the health of their occupants. Research is critically needed to evaluate the public health and environmental impacts of proposed wireless facilities before deployment.

Worldwide, governments are acting to minimize exposures to children as they are most vulnerable. For example, the Supreme Court of India upheld the High Court of the State of Rajasthan's decision to remove all cell towers from the vicinity of schools, hospitals and playgrounds because of radiation "hazardous to life." In Chile, the 2012 "[Antennae Law](#)" prohibits cell antennae/towers in "sensitive areas".²⁴ Please learn more about international policy actions such as these in our [online briefing](#).²⁵

The assumption that all wireless technology is safe has been shown through recent studies to be incorrect. EHT strongly opposes the widespread installation of 5G antennas and towers and believes that the state should move forward on its commitment to support the installation of fiber optic cables buried in the ground to every business, home, school, and hospital in California. We urge the state not to ignore this evidence of harm from RF. Please vote "no" vote on SB 649 and uphold the rights of local government to protect public health and the environment.

Sincerely,



Devra Davis, PhD, MPH

Fellow, American College of Epidemiology

Visiting Prof. Hebrew Univ. Hadassah Medical Center & Ondokuz Mayıs Univ. Medical School

Associate Editor, *Frontiers in Radiation and Health*

President, Environmental Health Trust

²³ Blank, M., et al. "[International Appeal: Scientists call for protection from non-ionizing electromagnetic field exposure.](#)" *European Journal of Oncology*, vol. 20, no. 3/4, 2015, pp. 180-2.

²⁴ "[New communications antenna law in Chile.](#)" *Communications Law: Newsletter of the International Bar Association Legal Practice Division*, vol. 20, no. 1, 2013, pp. 14-16.

²⁵ "[International Policy Briefing: Cautionary Policy on Radiofrequency Radiation Actions by Governments, Health Authorities and Schools Worldwide.](#)" Environmental Health Trust, 2017.



American Academy of Environmental Medicine

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Executive Committee

April 22, 2013

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1955 Pauline Blvd Ste 100D
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To: Tony Pontes
Director of Education
Peel District School Board

President-Elect

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From: The American Academy of Environmental Medicine
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Jennifer Armstrong, M.D., FAAEM
3364 Carling Ave.
Ottawa, Ontario, Canada

The American Academy of Environmental Medicine (AAEM) strongly supports the use of wired Internet connections.

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Richard G. Jaeckle, M.D., FAAEM
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The AAEM comprises Medical Doctors, Osteopaths, and PhD researchers focusing on the effects of environmental agents on human health. For forty years the Academy has trained Physicians to treat the most difficult patients who are often overlooked by our medical system, because the cause of their illness, rather than being caused by an infection or traditionally understood cause, is related to more basic underlying causes such as chemical, toxic metal, food or radiation exposures.

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In May 2011 the World Health Organization elevated exposure to wireless radiation, including WiFi, onto the Class 2b list of Carcinogens.

There is consistent emerging science that shows people, especially children who are more vulnerable due to developing brains and thinner skulls, are affected by the increasing exposure to wireless radiation.

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In September 2010, the Journal of the American Society for Reproductive Medicine-Fertility and Sterility, reported that only four hours of exposure to a standard laptop using WiFi caused DNA damage to human sperm.

In December 2012 the American Academy of Pediatrics- representing 60,000 pediatricians, wrote to Congress requesting it update the safety levels of microwave radiation exposure especially for children and pregnant women.

Continuing Medical Education

Chair

James W. Willoughby, II, D.O.
24 Main St.
Liberty, MO 64068

In 2010 Canada's Parliamentary Standing Committee on Health heard three days of testimony from international scientists explaining why our national safety guideline (Safety Code 6) is out of date for the increasing exposure to wireless radiation in daily life. This guideline must not be enforced as the minimum standard for places where children spend long periods of time.

Co-Chair

Wm. Alan Ingram, M.D.
18015 Oak St Ste B
Omaha, NE 68130

In a school setting, children are exposed to WiFi for an unprecedented period of time for their entire childhood. Some of these signals will be much more powerful

than is received at home, due to the need for the signals to go through walls, and serve multiple computers simultaneously. At home families may chose to turn it off, or avoid wireless completely. The school signals are dozens of times more powerful than standard café and restaurant systems.

To install this widespread wireless internet access system in Peel District schools risks a widespread public health hazard that the medical system is not yet prepared to address. Statistics show that you can expect to see an immediate reaction in 3% and delayed effects in 30%, including teachers.

It is better to exercise caution and substitute with a safe alternate such as a wired connection, which is not classified as a possible carcinogen. While more research is being conducted children must be protected. Wired technology is not only safer, it is also stronger and more secure.

While the debate ensues about the dangers of WiFi, cell phone towers and cell phones, it is the doctors who must deal with the inevitable health effects. Until we can determine why some develop symptoms and others do not, and some are debilitated for indeterminate amounts of time, we implore you to not take this risk, with the health of so many children whose parents have entrusted you to keep them as safe as possible while at school.

Respectfully,

The Executive Committee of the American Academy of Environmental Medicine

Cc: Janet McDougald,
Chair, Peel District School Board.



Dr. Magda Havas, B.Sc., Ph.D.

Environme

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Date: February 15, 2013

To: Peel District School Board, Mississauga, Ontario
Chair of Trustees, Janet McDougald
Director of Education, Tony Pontes
Trustees, Teachers, and Parents

Re: OPEN LETTER: Wi-Fi in the Peel District School Board

I am a professor in a Canadian University where I do research on the biological effects of radio frequency radiation. I implore you to NOT make the same mistake that we are currently making in many schools across Canada, namely installing wireless internet in our schools and thus exposing students and their teachers to microwave radiation all day and every school day.

The **safest way to connect to the Internet in the classroom** is through either **Ethernet cable** or through **fiber optics**. The worst way to connect to the Internet, from a health perspective, is through Wi-Fi routers. However, if Wi-Fi routers are deployed in the classroom it is **essential** that the routers be turned off when not in use and/or turned down to minimize exposure of students and staff. Ideally it would be useful to have a Wi-Fi free zone (commonly referred to as a “white zone”) for those who are unable to tolerate this radiation.

The **scientific evidence** clearly shows that microwave radiation at levels well below the our federal guidelines (Health Canada’s Safety Code 6, 2009) and at levels now commonly found in classrooms with Wi-Fi routers causes cancer in laboratory animals, causes heart palpitations in sensitive adults, causes reduced sperm motility and viability, and is associated with symptoms of electrosensitivity that include—but are not limited to—cognitive dysfunction, pain, fatigue, mood disorders (depression, anxiety, irritability), dizziness, nausea, weakness, skin problems, and tinnitus.

As an example, we did a study that showed that microwave radiation (pulsed 2.4 GHz frequency) at levels less than 0.5% of the Health Canada’s guidelines caused either an **irregular** or a **rapid heart rate** in adults who were sensitive to this radiation (Havas et al. 2010). See: http://www.youtube.com/watch?v=_E19fZX4iww.

This heart abnormality is often associated with feelings of anxiety as well as pain or pressure in the chest similar to what one might experience during a heart attack. Children are likely to be much more sensitive than adults. Students in Canadian schools with Wi-Fi are now complaining of heart palpitations and feelings of weakness and fatigue in the classroom. They feel well at home during the evening, weekend, and while on vacation. This is not school phobia as many of these students enjoyed school prior to the Wi-Fi being installed. Students with metal braces on their teeth are more likely to be adversely affected as the metal in the mouth can cause radiation hotspots in the head. See: <http://www.youtube.com/watch?v=h-TJXRc5fzo>

Several students in one school board in Ontario have experienced **sudden cardiac arrest**, which is becoming increasingly common but poorly known outside of a narrow scientific community. As a result schools are now installing defibrillators (for sudden cardiac arrest) and removing microwave ovens (whose signal interferes with the Wi-Fi routers).

Teachers who complain of feeling ill in the classroom with Wi-Fi routers are often silenced. Many fear losing their jobs and are afraid to speak out. They suffer in silence until they are no longer able to tolerate the exposure and then they go on temporary or permanent sick leave, which can become a significant expense to the school district.

The current **guidelines for microwave radiation** are based on a heating effect of a healthy adult male (as the guidelines were originally designed for military personnel working near radar antennas that also emit microwave radiation). These guidelines were not designed nor were they intended to protect children and pregnant women.

The guideline in Canada is calculated as the average exposure over a 6-minute period that does not raise the body tissue temperature by 1 degree Celsius. Canada has no long-term guideline and no biological guideline for microwave radiation. The guidelines in Russia, Switzerland and many other countries are 100 times more protective than those in the Canada and the United States. This simply does not make sense as the people in these countries are not necessarily more vulnerable. Their government is taking greater precautions to protect its citizens.

Furthermore, in 2011 the World Health Organization classified radio frequency electromagnetic fields as a possible human carcinogen, which is a warning to governments around the world. Why would we want to place a possible human carcinogen in the classroom?

The scientific community is often several decades ahead of policy and there are forces in society that do not want the public to know that this radiation may be harmful. Indeed, history is simply repeating itself with microwave radiation just as it did with cigarette smoking, asbestos, lead and DDT.

- We know that cigarette smoking is harmful and no longer allow it in many public places. Yet it took decades after we had solid scientific evidence that smoking caused heart disease and lung cancer before the Surgeon General made a public statement on the harmful effects of smoking. It was just too lucrative financially and the tobacco

lobby kept producing misinformation to keep the public ignorant, or at least doubtful, about the harmful effects of tobacco.

- We have learned that lead causes learning problems in children and no longer add lead to paint or to gasoline. Indeed if we receive toys from China with leaded paint, the toys are returned.
- We know that DDT is harmful to birds and other top carnivores (including humans) and have restricted its use in North America despite a strong chemical lobby.

Schools have generally been at the forefront of protecting students and teachers by removing asbestos in school buildings; by having nut-free schools for the small percentage who suffer from peanut allergies; and by changing cleaning products and by asking people to not wear perfume for those with chemical sensitivities. Students and teachers who have developed a **sensitivity to electrosmog**, which includes radio frequency radiation generated by wireless technology, require the same type of protection.

Electrosensitivity is an environmental sensitivity that is similar to a peanut allergy or chemical sensitivity. The consequences of exposure to radio frequency radiation may be mild (headaches, difficulty concentrating, fatigue, nausea, dizziness, tinnitus etc.) to life threatening (losing consciousness, sudden cardiac arrest, promotion of cancer growth). A small percentage of students have mild heart abnormalities that can be fatal with exercise combined with exposure to radio frequency radiation. Installing defibrillators is not the right approach.

How long will it take intelligent school board trustees, parents and teachers who would not knowingly do anything to jeopardize the health of students to recognize that microwave radiation in the classroom is a dumb idea. My scientific colleagues and I recognize the harmful effects of long-term exposure to microwave radiation and we simply cannot believe how quickly those who do not understand fully the ramifications of their uninformed decisions are deploying this technology.

I ask you to watch two videos to help you decide if microwave in the classroom is a good idea. The first video provides you with information on the type of Wi-Fi routers used in the classroom, how they differ from the Wi-Fi routers used at home and what the science shows on how harmful they are: <http://www.youtube.com/watch?v=6v75sKAUFdc>

The second video is an interview with students and parents about Wi-Fi in a school in Ontario and how the school responded to concerns raised about the health effects of this radiation. <http://www.youtube.com/watch?v=KN7VetsCR2I>

It is my sincere wish that we do the best we can to enhance the learning opportunities for all students and that we do so without jeopardizing their health.

Respectfully submitted,
Dr. Magda Havas, February 15, 2013.

XXX



STEPHEN T. SINATRA M.D., F.A.C.C.

F.A.C.N., C.N.S., C.B.T.,

Integrative Metabolic Cardiology

April 15, 2011

Chairman and Trustees
Kawartha Pine Ridge District School Board Education Centre
1994 Fisher Drive
Peterborough, Ontario
K9J7A1

RE: WiFi in Schools

Dear Chairman and Trustees:

The heart is a delicate and complex electromagnetic organ that can be adversely affected by exogenous signals from wireless technology and microwave radiation. For this reason it is unwise to expose students and teachers to WiFi radiation for internet access, especially when safer alternative wired options are available.

Children are particularly vulnerable to this radiation and the incidents of cardiovascular events including sudden cardiac arrest, seems to be increasing, especially among young athletes (up to the age of 19). In some cases this is due to undetected heart defects, blunt trauma to the heart in contact sports, and heat stress during strenuous exercise, but in other instances these irregularities may be exacerbated by or due to microwave signals interfering with the autonomic nervous system that regulates the heart.

I know this because I am a board certified cardiologist and have been a Fellow of the American College of Cardiology since 1977. At the Manchester Memorial Hospital in Connecticut, I served in several roles, including Chief of Cardiology, Director of Cardiac Rehabilitation, and Director of Medical Education.

In both Canada and the United States a large number of students are complaining that they feel unwell in classrooms that have WiFi technology. These complaints have been investigated and what emerges is the following:

1. Symptoms common among these students include headaches, dizziness, nausea, feeling faint, pulsing sensations or pressure in the head, chest pain or pressure, difficulty concentrating, weakness, fatigue, and a racing or irregular heart accompanied by feelings of anxiety. These symptoms may seem diverse but they indicate autonomic dystonia or dysfunction of the autonomic nervous system.

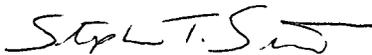
2. Symptoms do not appear in parts of the school that do not have this technology (WiFi-free portables) and they do not appear in homes that do not have wireless technology.
3. One student, scheduled for heart surgery, was able to avoid surgery by reducing exposure to microwave radiation.
4. We know that the heart is sensitive to and can be adversely affected by the same frequency used for WiFi (2.4 GHz) at levels a fraction of federal guidelines (less than 1%) and at levels that have been recorded in two Ontario schools with WiFi technology.
5. The incidence of sudden cardiac arrests (SCA) among young athletes is increasing and doctors don't know why. In one small Ontario community, the number of students experiencing SCA is disturbingly high. Whether WiFi and nearby cell phone antennas exacerbate SCA needs to be investigated further before students are subjected to these fields.

In conclusion it is unwise to install wireless technology (WiFi) in schools. We do not know what the long-term effects of low-level microwave radiation are on students and teachers. The safety of this technology on children has not been tested and I would advise that you follow the precautionary principle that states the following:

"In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."
(Rio Conference 1992).

The principle implies that we have a social responsibility to protect the public from exposure to harm, when scientific investigations have found a plausible risk. That "plausible risk" exists for microwave radiation at very low levels. These protections can be relaxed only if further scientific findings emerge that provide sound evidence that no harm will result. In some legal systems the application of the precautionary principle has been made a statutory requirement.

Sincerely,



Stephen T. Sinatra, M.D., F.A.C.C., F.A.C.N., C.N.S.

The Health Argument against Cell Phones and Cell Towers

The biomedical evidence showing that the radiofrequency radiation emitted by cell phones and cell towers is harmful to health continues to grow. This document summarizes the health argument against cellular technology, whatever the benefits of that technology may be. You may wish to inform yourself about these arguments for any of several reasons:

- You use a cell phone.
- You encourage, or do not discourage, the use of cell phones by family members.
- You live in, or are contemplating moving into, a community close to a cell tower.
- Your school, college, fire station, or police station is considering permitting the installation of a cell tower on its property.
- Your community is considering permitting the installation of cellular repeaters, small-cell towers, or even full cell towers within its jurisdiction.

Below, I introduce myself, provide evidence of the harmfulness of cellular radiation, and show that U.S. Government is not protecting us from harm and is unlikely to do so in the near future. That means that we must protect ourselves and our families at the individual and the community levels while working toward protective action by governments at the local, state, and Federal levels.

Who am I?

I am a retired U.S. Government career scientist (Ph.D., Applied Physics, Harvard University, 1975). During my Government career, I worked for the Executive Office of the President of the United States, the National Science Foundation, and the National Institute of Standards and Technology. For those organizations, respectively, I addressed Federal research and development program evaluation, energy policy research, and measurement development in support of the electronics and electrical-equipment industries and the biomedical research community. I currently interact with other scientists and with physicians around the world on the impact of electromagnetic fields on human health.

Evidence of harm

I present below key evidence, and associated references, that the exposure of humans to radiofrequency radiation, and specifically cellular radiation, is harmful to health.

In 2016, the National Toxicology Program, at the National Institutes of Health, linked cellular radiation to brain and heart tumors.

The National Toxicology Program (NTP), at the National Institutes of Health (NIH), just published the “Partial Findings” of a \$25 million multi-year study of the impact of cellular radiation on health. The U.S. Food and Drug Administration “nominated” this NTP study. The NTP indicated that this is the largest and most complex study ever conducted by the NTP.

¹ Ronald M. Powell, Ph.D., USA, email ronpowell@verizon.net, web site <https://www.scribd.com/document/291507610/>.

The NTP study exposed each of six separate groups of male rats to one of the six possible combinations of three different levels of cellular radiation and two different modulation formats. The modulation format is the method used to impress information on the cellular signal. A separate seventh group of male rats was used as a “control”, that is, for comparison, and was protected from exposure to any cellular radiation.

The NTP study found a “likely” causal relationship between exposure to cellular radiation and the occurrence of malignant (cancerous) brain tumors (glioma) and malignant nerve tumors (a form of schwannoma) of the heart in the male rats:

The rates of occurrence of brain glioma in the male rats ranged from 0 to 3.3 percent for the six groups exposed to radiation. The mean rate of occurrence was 2.0 percent across all six groups.²

The rates of occurrence of heart schwannoma in the male rats ranged from 1.1 to 6.6 percent for the six groups exposed to radiation. The mean rate of occurrence was 3.5 percent across all six groups.³

The seventh group of male rats, which was used as a control and which was protected from exposure to any cellular radiation, experienced no instances of brain glioma or heart schwannoma.

The NTP considered its findings so important to public health that it issued the “Partial Findings” (May 2016) prior to completing the full study. The NTP then presented those findings at an international conference (BioEM2016, June 2016) attended by 300 scientists from 41 countries. The NTP characterized the motivation for the early release of the “Partial Findings” this way:

“Given the widespread global usage of mobile communications among users of all ages, even a very small increase in the incidence of disease resulting from exposure to RFR [radiofrequency radiation] could have broad implications for public health. There is a high level of public and media interest regarding the safety of cell phone RFR and the specific results of these NTP studies.”

You can learn more about this study from the following references:

Reference: NTP’s brief description of its study. National Toxicology Program: Cell Phones.
(<http://ntp.niehs.nih.gov/results/areas/cellphones/index.html>)

Reference: NTP’s published “Partial Findings” of the study. Michael Wyde, Mark Cesta, Chad Blystone, Susan Elmore, Paul Foster, Michelle Hooth, Grace Kissling, David Malarkey, Robert Sills, Matthew Stout, Nigel Walker, Kristine Witt, Mary Wolfe, and John Bucher, Report of Partial Findings from the National Toxicology Program Carcinogenesis Studies of Cell Phone Radiofrequency Radiation in Hsd: Sprague Dawley® SD rats (Whole Body Exposure), posted June 23, 2016.
(<http://biorxiv.org/content/biorxiv/early/2016/06/23/055699.full.pdf>)

Reference: Informative discussion of the NTP study. Environmental Health Trust, Frequently Asked Questions about the U.S. National Toxicology Program Radiofrequency Rodent Carcinogenicity Research Study.
(<http://ehtrust.org/science/facts-national-toxicology-program-cellphone-rat-cancer-study>)

² In the “Partial Findings” reference cited above, the mean (average) rate of occurrence for malignant glioma in male rats was determined from Table 1 on page 13 as follows: $(3 + 3 + 2 + 0 + 0 + 3)/(90 + 90 + 90 + 90 + 90 + 90) = 2.0$ percent.

³ In the “Partial Findings” reference cited above, the mean (average) rate of occurrence for malignant heart schwannoma in male rats was determined from Table 3 on page 15 as follows: $(2 + 1 + 5 + 2 + 3 + 6)/(90 + 90 + 90 + 90 + 90 + 90) = 3.5$ percent.

Reference: Announcement of the BioEM2016 presentation. Results of NIEHS' National Toxicology Program GSM/CDMA phone radiation study to be presented at BioEM2016 Meeting in Ghent, 05 June 2016 — 10 June 2016 Ghent University, Belgium.

(<http://www.alphagalileo.org/ViewItem.aspx?ItemId=164837&CultureCode=en>)

Reference: Viewgraphs presented by Michael Wyde, Ph.D., NTP study scientist, at BioEM2016 Meeting, Ghent, Belgium, June 8, 2016. NTP Toxicology and Carcinogenicity Studies of Cell Phone Radiofrequency Radiation.

(http://ntp.niehs.nih.gov/ntp/research/areas/cellphone/slides_bioem_wyde.pdf)

In September 2017, the NTP presented further findings from its study of the impact of cellular radiofrequency radiation on the DNA of both mice and rats. The NTP found the following:

“These results suggest that exposure to RFR [radiofrequency radiation] has the potential to induce measurable DNA damage under certain exposure conditions.”

Reference: Abstract of data presented at the annual meeting of the Environmental Mutagenesis and Genomics Society, Raleigh, North Carolina, September 9-13, 2017. SL Smith-Roe and others, Evaluation of the Genotoxicity of Cell phone Radiofrequency Radiation in Male and Female Rats and Mice Following Subchronic Exposure.

(<https://ehtrust.org/national-toxicology-program-finds-cell-phone-radiation-induces-dna-damage/>)

Further findings from the NTP are promised for 2018.

The NTP study reinforces the classification of radiofrequency radiation, including cellular radiation, as a possible human carcinogen, made by the International Agency for Research on Cancer of the World Health Organization in 2011.

In its “Partial Findings” the NTP noted that its study reinforces a decision made by the International Agency for Research on Cancer (IARC) of the World Health Organization (WHO) in 2011. That decision classified radiofrequency radiation, including specifically cellular radiation, as a Group 2B carcinogen (possible carcinogen for humans). This classification was based on the increased risk of brain cancer (glioma) and acoustic neuroma (a form of schwannoma).⁴

Reference: Announcement of the IARC classification. International Agency for Research on Cancer, IARC Classifies Radiofrequency Electromagnetic Fields as Possibly Carcinogenic To Humans, Press Release No. 208, 31 May 2011.

(http://www.iarc.fr/en/media-centre/pr/2011/pdfs/pr208_E.pdf)

Reference: Full report on the IARC classification. IARC Monographs: Non-Ionizing Radiation, Part 2: Radiofrequency Electromagnetic Fields, Volume 102, 2013.

(<http://monographs.iarc.fr/ENG/Monographs/vol102/mono102.pdf>)

The findings of the NTP study, in combination with the findings of other studies conducted since 2011, have greatly increased the likelihood that the IARC will raise its classification of radiofrequency radiation to

⁴ The Mayo Clinic describes acoustic neuroma here: <http://www.mayoclinic.org/diseases-conditions/acoustic-neuroma/basics/definition/CON-20023851>.

Group 2A (probable carcinogen for humans) or even to Group 1 (known carcinogen for humans) in the near future.

In 2015, hundreds of international scientists appealed to the United Nations and the World Health Organization to warn the public about the health risks caused by electromagnetic fields (EMF), including radiofrequency radiation and, specifically, cellular radiation.

As of January 29, 2017, 224 scientists from 41 nations have signed an international appeal first submitted to the United Nations and to the World Health Organization in May 2015. These scientists seek improved protection of the public from harm caused by the radiation produced by many wireless sources, including "cellular and cordless phones and their base stations, Wi-Fi, broadcast antennas, smart meters, and baby monitors" among others. Together, these scientists "have published more than 2000 research papers and studies on EMF." They state the following:

"Numerous recent scientific publications have shown that EMF affects living organisms at levels well below most international and national guidelines. Effects include increased cancer risk, cellular stress, increase in harmful free radicals, genetic damages, structural and functional changes of the reproductive system, learning and memory deficits, neurological disorders, and negative impacts on general well-being in humans. Damage goes well beyond the human race, as there is growing evidence of harmful effects to both plant and animal life."

Reference: Welcome to EMFscientist.org.
(<https://www.emfscientist.org>)

Reference: International EMF Scientist Appeal: Scientists call for Protection from Non-ionizing Electromagnetic Field Exposure, May 15, 2015 (updated October 10, 2016).
(<https://www.emfscientist.org/index.php/emf-scientist-appeal>)

Reference: International Scientists Petition U.N. to Protect Humans and Wildlife from Electromagnetic Fields and Wireless Technology.
(https://www.emfscientist.org/images/docs/International_EMF_Scientist_Appeal_Description.pdf)

In 2012, the BioInitiative Working Group published the most comprehensive of the recent analyses of the international biomedical research, showing a multitude of biological effects from exposure to radiofrequency radiation, including cellular radiation, at levels below the current exposure guidelines set by the Federal Communications Commission (FCC).

The health risks posed by the expanding use of radiofrequency radiation in wireless devices are not limited to cancer, as devastating as that consequence is. The broad range of health effects was extensively reviewed in the BioInitiative Report 2012. This 1479-page review considered about 1800 peer-reviewed biomedical research publications, most issued in the previous five years. The BioInitiative Report 2012 was prepared by an international body of 29 experts, heavy in Ph.D.s and M.D.s, from 10 countries, including the USA which contributed the greatest number of experts (10). The report concluded the following:

"The continued rollout of wireless technologies and devices puts global public health at risk from unrestricted wireless commerce unless new, and far lower exposure limits and strong precautionary warnings for their use are implemented."

Reference: BioInitiative Working Group, Cindy Sage, M.A. and David O. Carpenter, M.D., Editors, BioInitiative Report: A Rationale for Biologically-based Public Exposure Standards for Electromagnetic Radiation, December 31, 2012.

(<http://www.bioinitiative.org>)

The BioInitiative Report 2012 documented, in its “RF Color Charts”, examples of eight categories of biological effects that occurred at levels below the current exposure guidelines set by the FCC:

- stress proteins, heat shock proteins, and disrupted immune function
- reproduction and fertility effects
- oxidative damage, reactive ion species (ROS), DNA damage, and DNA repair failure
- disrupted calcium metabolism
- brain tumors and blood-brain barrier
- cancer (other than brain) and cell proliferation
- sleep, neuron firing rate, electroencephalogram (EEG), memory, learning, and behavior
- cardiac, heart muscle, blood-pressure, and vascular effects.

These biological effects were attributed to “Radiofrequency Radiation at Low Intensity Exposure” from “cell towers, Wi-Fi, wireless laptops, and smart meters”.

Reference: See the “RF Color Charts”, accessed from the left column of the web page below.

(<http://www.bioinitiative.org>)

The U.S. Government is not protecting us.

The radiation exposure guidelines of the FCC do not protect us because they are outdated and based on a false assumption.

The current radiation exposure guidelines of the FCC were adopted in 1996, 20 years ago. Those guidelines are based primarily on an analysis by the National Council on Radiation Protection and Measurements (NCRP) which was published in 1986, 30 years ago. That was many years before the emergence of nearly all of the digital wireless devices in use today.

“The FCC-adopted limits for Maximum Permissible Exposure (MPE) are generally based on recommended exposure guidelines published by the National Council on Radiation Protection and Measurements (NCRP) in 'Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields,' NCRP Report No. 86, Sections 17.4.1, 17.4.1.1, 17.4.2 and 17.4.3. Copyright NCRP, 1986, Bethesda, Maryland 20814....”

Reference: Federal Communications Commission, Office of Engineering & Technology, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields, OET Bulletin 65, Edition 97-01 (August 1997). See the last paragraph on page 64.

(http://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet65/oet65.pdf)

Those exposure guidelines have not been substantially changed since that analysis in 1986. They are based on the *thermal assumption* that the only harm that radiofrequency radiation can cause is due to tissue heating. This thermal assumption has been thoroughly disproved since, as biological effects have been found to occur

at levels of radiation below, and even far below, those that cause significant tissue heating. Such lower levels are commonly referred to as *nonthermal* levels. The result is that many authorities now consider the FCC's current exposure guidelines as entirely outdated and much too high (that is, much too permissive) to protect the public.

The evidence disproving the thermal assumption is based on the broadened understanding of the biological effects of radiofrequency radiation made possible by thousands of peer-reviewed papers published by international biomedical scientists since 1986. The BioInitiative Report 2012 is the most recent comprehensive review of that research and provides many examples of bioeffects occurring at nonthermal radiation levels, as described above. Further, the new study by the National Toxicology Program, also described above, added to the evidence disproving the thermal assumption. That study exposed rats to levels of radiation below those that cause significant heating, and both above and below the FCC's current exposure guidelines as well. Yet, even below the FCC's current exposure guidelines, the male rats still developed malignant brain cancer (glioma) and malignant tumors (schwannomas) of the nerves of the heart. The shortcomings of the FCC's exposure guidelines are described in detail in the following reference:

Reference: Outdated FCC "Safety" Standards: The Five Fallacies of the Electromagnetic Radiation Exposure Limits.

<http://ehtrust.org/policy/fcc-safety-standards/>

The FCC is not a credible source for exposure guidelines because it lacks health expertise and because it is too heavily influenced by the wireless industries that it is supposed to regulate.

The FCC lacks the health expertise required for developing health-related radiation exposure guidelines. Further, the FCC seems more interested in assuring compatibility among electronic systems than in assuring the compatibility of electronic systems with human, animal, and plant life. Since the exposure guidelines relate to health, it would make more sense for them to be developed by an agency with health expertise, such as the Environmental Protection Agency (EPA).

In addition, the FCC lacks the impartiality required to be a source of credible guidelines. The FCC is too heavily influenced by the wireless industries that the FCC is supposed to regulate. The FCC has acted in partnership with the wireless industries by permitting wireless radiation levels far higher than the biomedical research literature indicates are necessary to protect human health. The success of the wireless industries in capturing the FCC, the committees in the U.S. Congress that oversee the FCC, and the Executive Branch is detailed in a recent monograph from the Center for Ethics at Harvard University.

Reference: Norm Alster, Captured Agency: How the Federal Communications Commission is Dominated by the Industries It Presumably Regulates (2015).

<http://ethics.harvard.edu/news/new-e-books-edmond-j-safra-research-lab>

As an example of that capture, President Obama, in 2013, appointed Thomas Wheeler, as the Chairman of the FCC. At that time, Mr. Wheeler was the head of the CTIA – The Wireless Association, which is the major lobbying organization for the wireless industries. This is the infamous "revolving door".

The FCC's decision to fast-track Fifth Generation (5G) cellular technology without prior study of its health impact demonstrates the FCC's disinterest in the public health.

On July 14, 2016, the FCC adopted new rules that would promote fast-tracking the expansion of cellular service to new and higher frequencies as part of the Fifth Generation (5G) of cellular technology. This decision will open selected frequency bands above 24 gigahertz (GHz) and up to 71 GHz. At the same time, the FCC has requested comment on opening even higher frequencies, possibly above 95 GHz.

Reference: FCC Takes Steps to Facilitate Mobile Broadband and Next Generation Wireless Technologies in Spectrum above 24 GHz: New rules will enable rapid development and deployment of next generation 5G technologies and services.

(http://transition.fcc.gov/Daily_Releases/Daily_Business/2016/db0714/DOC-340301A1.pdf)

Reference: Fact Sheet: Spectrum Frontiers Rules Identify, Open Up Vast Amounts of New High-Band Spectrum for Next Generation (5G) Wireless Broadband.

(http://transition.fcc.gov/Daily_Releases/Daily_Business/2016/db0714/DOC-340310A1.pdf)

All five commissioners of the FCC, including Chairman Thomas Wheeler, approved this expedited move to 5G. No commissioner called for evaluating the health impact before proceeding with 5G, despite the recent findings of the National Toxicology Program at NIH that cellular radiation likely causes tumors. Nor did even one commissioner express any interest in, or concern about, the impact of this new technology on public health. Rather, the FCC's emphasis was on the billions of dollars to be made by proceeding to implement 5G as rapidly as possible, with a minimum of regulatory interference, to assure an international competitive position.

In contrast to the FCC's disinterest in the impact of 5G on the public health, extensive written comments from individual members of the public and from many interested organizations raised a host of health concerns that were totally ignored in the FCC's presentations.

Reference: July 2016 Open Commission Meeting addressing "Spectrum Frontiers" and "Advancing Technology Transitions".

(<https://www.fcc.gov/news-events/events/2016/07/july-2016-open-commission-meeting>)

Reference: The FCC Approves 5G Millimeter Wave Spectrum Frontiers. Includes excerpts from selected comments provided to the FCC by individuals and organizations that expressed concern about the health impact of the FCC's plan for 5G.

(<http://ehtrust.org/policy/fcc-approves-5g-millimeter-wave-spectrum-frontiers/>)

Reference: Comments on FCC Docket 14-177, Spectrum Bands above 24 GHz. All of the comments submitted to the FCC about the key docket leading to the implementation of 5G.

(https://www.fcc.gov/ecfs/search/filings?proceedings_name=14-177&sort=date_disseminated,DESC)

U.S. Government agencies, and U.S. medical organizations, have disputed the validity of the FCC's exposure guidelines.

U.S. Government agencies, as well as U.S. medical organizations, have disputed the validity of the FCC's thermal exposure guidelines, maintaining that they are outdated and need to be updated to provide adequate protection of human beings, including children and seniors as well as other vulnerable groups.

U.S. Environmental Protection Agency

The Environmental Protection Agency (EPA) would be a better agency than the FCC to entrust with setting radiofrequency radiation exposure guidelines because the EPA has both health expertise and environmental responsibilities. The EPA is often cited by the FCC, and by the wireless industries, as one of the agencies that the FCC has *consulted* about the FCC's exposure guidelines, as if to increase the credibility of those guidelines. However, the fact that the EPA has *explicitly disputed* the validity of those guidelines is consistently omitted from those FCC citations.

Specifically, in 2002, the EPA addressed the limitations of the thermal exposure guidelines of the FCC, and the similar guidelines of private organizations, including the Institute of Electrical and Electronics Engineers and the International Commission on Non-Ionizing Radiation Protection:

“The FCC’s current exposure guidelines, as well as those of the Institute of Electrical and Electronics Engineers (IEEE) and the International Commission on Non-ionizing Radiation Protection, are thermally based, and do not apply to chronic, nonthermal exposure situations.... The FCC’s exposure guideline is considered protective of effects arising from a thermal mechanism but not from all possible mechanisms. Therefore, the generalization by many that the guidelines protect human beings from harm by any or all mechanisms is not justified.”

“Federal health and safety agencies have not yet developed policies concerning possible risk from long-term, nonthermal exposures. When developing exposure standards for other physical agents such as toxic substances, health risk uncertainties, with emphasis given to sensitive populations, are often considered. Incorporating information on exposure scenarios involving repeated short duration/nonthermal exposures that may continue over very long periods of time (years), with an exposed population that includes children, the elderly, and people with various debilitating physical and medical conditions, could be beneficial in delineating appropriate protective exposure guidelines.”

Reference: Letters from Frank Marcinowski, Director, Radiation Protection Division, EPA, and Norbert Hankin, Center for Science and Risk Assessment, Radiation Protection Division, EPA, to Janet Newton, President, the EMR Network, with copies to the FCC and the IEEE, dated July 16, 2002.

http://www.emrpolicy.org/litigation/case_law/docs/noi_epa_response.pdf

In summary, the EPA makes the following points: (1) the FCC’s thermal exposure guidelines do *not* protect against all harm, only the harm caused by too much heating; (2) the FCC’s thermal exposure guidelines do *not* apply to “chronic, nonthermal exposure”, which is the type of exposure generated by cell towers and many other wireless devices; and (3) when new FCC guidelines are developed for chronic nonthermal exposures, they must accommodate "children, the elderly, and people with various debilitating physical and medical conditions" because those groups are not accommodated now.

U.S. Food and Drug Administration

The Food and Drug Administration (FDA) is also often cited by the FCC, and by the wireless industries, as one of the agencies that the FCC has consulted about exposure guidelines. But the FDA is the agency that “nominated” the NTP study of the possible health effects of cellular radiation, in part because of the FDA’s uncertainty about the validity of the FCC’s exposure guidelines:

“Currently cellular phones and other wireless communication devices are required to meet the radio frequency radiation (RFR) exposure guidelines of the Federal Communications Commission (FCC),

which were most recently revised in August 1996. The existing exposure guidelines are based on protection from acute injury from thermal effects of RFR exposure, and may not be protective against any non-thermal effects of chronic exposures.”

Reference: Nominations from FDA’s Center from [for] Device[s] and Radiological Health, Radio Frequency Radiation Emissions of Wireless Communication Devices (CDRH), Executive Summary, as attached to transmittal letter from William T. Allaben, Ph.D., FDA Liaison, to Dr. Errol Zeiger, Coordinator, Chemical Nomination and Selection, National Toxicology Program, May 19, 1999,⁵ (http://ntp.niehs.nih.gov/ntp/htdocs/chem_background/exsumpdf/wireless051999_508.pdf)

The FDA’s wisdom in nominating the NTP study was well justified by the NTP’s publication of the “Partial Findings” described above. Those findings demonstrated both that the FCC’s exposure guidelines are not protective and that the thermal assumption on which those guidelines are based is invalid.

U.S. Department of the Interior

In 2014 the Department of the Interior (Fish and Wildlife Service) also addressed the limitations of the FCC’s thermal exposure guidelines. The Department of the Interior was motivated by the multiple adverse effects of electromagnetic radiation on the health, and the life, of birds, particularly in connection with cell towers. The Department of the Interior stated the following:

“However, the electromagnetic radiation standards used by the Federal Communications Commission (FCC) continue to be based on thermal heating, a criterion now nearly 30 years out of date and inapplicable today.”

Reference: Letter from Willie R. Taylor, Director, Office of Environmental Policy and Compliance, Office of the Secretary, United States Department of the Interior, to Mr. Eli Veenendaal, National Telecommunications and Information Administration, U.S. Department of Commerce, dated February 7, 2014. (https://www.ntia.doc.gov/files/ntia/us_doi_comments.pdf)

American Academy of Environmental Medicine

The American Academy of Environmental Medicine (AAEM), which trains physicians in preparation for Board Certification in Environmental Medicine, states the following:

“The AAEM strongly supports the use of wired Internet connections, and encourages avoidance of radiofrequency such as from WiFi, cellular and mobile phones and towers, and ‘smart meters’.”

"The peer reviewed, scientific literature demonstrates the correlation between RF [radiofrequency] exposure and neurological, cardiac, and pulmonary disease as well as reproductive and developmental disorders, immune dysfunction, cancer and other health conditions. The evidence is irrefutable."

“To install WiFi in schools plus public spaces risks a widespread public health hazard that the medical system is not yet prepared to address.”

⁵ This date and the referenced URL were changed when this superior reference was posted, at my request, by the NTP/NIEHS/NIH.

Reference: American Academy of Environmental Medicine, Wireless Radiofrequency Radiation in Schools, November 14, 2013.

(<http://www.aeonline.org/pdf/WiredSchools.pdf>)

American Academy of Pediatrics

The American Academy of Pediatrics (AAP), whose 60,000 doctors care for our children, supports the development of more restrictive standards for radiofrequency radiation exposure in order to better protect the public, particularly the children. In a letter to the Federal Communications Commission (FCC) and the Food and Drug Administration (FDA), dated August 29, 2013, the AAP states the following:

“Children are not little adults and are disproportionately impacted by all environmental exposures, including cell phone radiation. Current FCC standards do not account for the unique vulnerability and use patterns specific to pregnant women and children. It is essential that any new standard for cell phones or other wireless devices be based on protecting the youngest and most vulnerable populations to ensure they are safeguarded throughout their lifetimes.”

Reference: American Academy of Pediatrics, letter dated August 29, 2013 addressed to The Honorable Mignon L. Clyburn, Acting Commissioner, Federal Communications Commission, and The Honorable Dr. Margaret A. Hamburg, Commissioner, U.S. Food and Drug Administration.

(<http://apps.fcc.gov/ecfs/document/view?id=7520941318>)

After reviewing the “Partial Findings” from the new study by the National Toxicology Program at the National Institutes of Health, described above, the American Academy of Pediatrics cautioned parents about the use of cell phones by their children:

“In light of the findings, the Academy continues to reinforce its recommendation that parents should limit use of cell phones by children and teens.”

Reference: American Academy of Pediatrics, AAP responds to study showing link between cell phone radiation, tumors in rats, May 27, 2016.

(<http://www.aappublications.org/news/2016/05/27/Cancer052716>)

The Telecommunications Act of 1996, in combination with the FCC’s exposure guidelines, empowers the wireless industries to mandate the exposure of the public to levels of radiofrequency radiation already found harmful to health.

The Telecommunications Act of 1996 bars state and local governments from objecting to the placement of cell towers on environmental/health grounds unless the FCC’s exposure guidelines would be exceeded. Specifically, the Act states the following:

“No State or local government or instrumentality thereof may regulate the placement, construction, and modification of personal wireless service facilities on the basis of the environmental effects of radio frequency emissions to the extent that such facilities comply with the Commission's [FCC’s] regulations concerning such emissions.”

Reference: Telecommunications Act of 1996, Section 704 Facilities Siting; Radio Frequency Emission Standards, page 117.

<http://transition.fcc.gov/Reports/tcom1996.pdf>

This Act, in combination with the FCC's permissive exposure guidelines, strips state and local governments of the right to protect their own residents from levels of radiofrequency radiation already shown to be harmful to health. In effect, this Act transfers to the wireless industries the right to **mandate** the exposure of the public, including those most vulnerable to harm, to radiofrequency radiation without the need for further governmental action. State and local governments can still resist, but to do so they must confront this Act which is designed to frustrate their success. Even so, some governments do heroically resist and some do succeed.

Protecting ourselves and our families

We can act on our own to protect ourselves and our families, but only partially.

Instead of increasing our exposure to cellular radiation, and to the radiation from other digital wireless devices, we can decrease our exposure and improve our chances for good health. Desirable steps in this direction include the following:

- Reduce or stop the use of cell phones. Reserve them for emergencies or other essential uses.
- Replace cordless telephones with corded telephones.
- Establish wired (Ethernet) interconnections between routers and the wireless devices that the routers support. Then turn off the wireless capabilities, such as Wi-Fi and Bluetooth, of them all.
- "Opt out" of the wireless smart meter on your residence, if your state or local electric power company permits. Many states, but not all, have an opt-out provision.
- Alert family members about the health risks posed by wireless devices, particularly for vulnerable groups such as pregnant mothers, unborn children, young and teenage children, adult males of reproductive age, seniors, the disabled, and anyone with a chronic health condition. Everyone is vulnerable, but these groups are more so.

Reference: For more information on reducing radiation at home, please see Ronald M. Powell, Ph.D., How to Reduce the Electromagnetic Radiation in Your Home, which is document (10) on the following list.

<https://www.scribd.com/document/291507610/>

We can obtain better protection if we work together.

We can contribute our efforts to the hundreds of new organizations that are emerging nationwide to raise awareness about the health risks posed by the radiation exposure from wireless devices in homes, in the workplace, in schools, and in public places, especially where children are present. Through the Internet, look for organizations that address the intersection of health with cell phones, cordless phones, Wi-Fi, smart meters, and wireless desktop computers, laptops, and tablets. These wireless devices are the principal sources of radiofrequency radiation in the home.

Take care for our children. Today's adults grew up in an environment with much less radiofrequency radiation than exists today. Today's children are not so lucky. To have the same chance at a healthy life, they need a lot of help. Unfortunately, the levels of radiofrequency radiation in our environment are rising exponentially as

governments and wireless industries continue to promote, and even mandate, the exposure of the public to ever higher levels of radiofrequency radiation, with no limit in sight. That means that many of our children will become chronically ill, and many will die, while still young adults. This is a tragedy in the making. To stop it will require greatly increased awareness of the problem and serious political action at multiple levels of government. That is no small task, but we all can help. We can join with others to become a part of the solution for ourselves and our families, but especially for our children and our grandchildren.



Susan D. Foster

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February 9, 2019

Arthur Feinstein
Executive Committee
Sierra Club California – San Francisco

Re: 5G/ Requesting Sierra Club California Conservation Committee to Urge the National Conservation Policy Committee to Oppose Removal of Local Control & Environment Review.

Dear Executive Committee of the Sierra Club California:

I would like to share a cautionary tale with you about the firefighters of California and ask you to implore your National Conservation Policy Committee to take a strong stand in Washington to call for a moratorium on the buildout of the 5G infrastructure. Given legislation that passed Congress last fall, critical checks and balances of environmental review and local control are missing.

Fire stations have long been a desired and early target of the telecommunications industry. The industry favors fire stations as locations because they are almost always placed near population centers and heavily traveled roadways. The telecommunications industry wants to reach people in their homes and on the road. Telecom has not had difficulty talking municipalities into granting leases on fire station land because the cities and towns reap the rental revenue from these leases. Thus firefighters, who often work and sleep at these stations, have a substantial 24/7 exposure to cell towers that the industry consistently promises are “low-energy” and “1/1000 of the radiation the FCC allows”. Such reassurances ring false when firefighters experience clusters of neurological and immunological illnesses after years of spending shift after shift in stations that are also home to the telecom industry’s towers.

The stance firefighters have taken in California to keep 5G cell towers off their stations should make every American family have heightened concern about the cell towers that are creeping into their neighborhoods on lampposts and monopoles and signage across America *without local control and any environmental review*. Is the cost of American health worth the added value of faster downloads of videos and driverless cars?

Firefighters of California have spent 15 years and millions of dollars fighting cell towers on their stations. They have done so because they know they are among the strongest of the strong when it comes to professionals among us. Yet they have suffered harm living and working in the presence of cell towers, and they know they cannot carry out their duties to protect the general public as they should if they are indeed impaired. Furthermore, they know that those they protect – the general public – are often more vulnerable than they are. Logic tells the firefighters, as it tells us, that if the strongest of the strong are harmed, the weakest and most vulnerable among us are at even greater risk.

California Firefighters as Canaries in the Coal Mine

Firefighters go through rigorous physical and cognitive testing before being hired by any California fire department. So when cell towers placed on or adjacent to fire stations cause obvious and even irreparable harm to the minds and bodies of our firefighters, something is obviously wrong. There is a lesson to be heeded. This is happening in California, and anecdotally, it is happening across the country. It is not happening at every station, but it is certainly happening at many stations where the cell tower radiation is beamed across the living quarters of the firefighters.

Therefore, what is the risk going to be for every unborn baby, every child, every woman, every elderly person, everyone with a chronic illness, people with allergies and chemical sensitivities, and even strong men with larger body mass and thus greater resiliency, when 5G towers beam untested millimeter waves 24/7 through the walls of homes into living rooms and second-story bedrooms where children sleep?

We think of the proverbial canary in the coal mine as harbingers of danger. Coal miners took canaries in a cage down to the depths of the earth to sound a silent alarm when they were in danger. When the canary fell off its perch from lack of oxygen, it was a warning sign to the miners that oxygen was running low and they needed to get to the surface before they collapsed.

It is hard to believe that firefighters have become our society's "canaries in a coal mine", but that is exactly what I am about to describe to you. As you read the results of a small pilot study we conducted of California firefighters exposed to cell towers on their stations for five years, understand that this brain damage occurred to the strongest of the strong among us after a five-year exposure to 2G. That was three generations of wireless ago, so the question must be asked: **What is going to happen to this entire country when 5G cell towers are deployed every 2 to 10 homes throughout this country?**

As you consider this critical issue and the position the Sierra Club takes regarding the recent removal by Congress of local control and environmental review with respect to cell tower placement, it is essential to know the following. There is no safe level of 5G millimeter wave radiation that has been established, there have been no tests of 5G exposure 24/7 on animals or humans, and there is no Health & Safety division of the Federal Communications Commission, yet our health and society's safety have been entrusted to the FCC.

If you contact the FCC to express concern regarding risk factors of 5G, they will refer you to the FDA. The FDA, which originally had authority over safety with respect to cell phones, gave a “pass” to the telecommunications industry. Thus the premarket testing phase for cell phones was skipped before they were launched onto the market. In a sense, a “pass” has just been given to the industry for 5G cell towers that are rapidly coming into our residential areas – now unfettered by any local control whatsoever.

However, concern is growing within Washington DC and across the country, and perhaps it is time for wise voices to stand up and ask for a return of local control and a return of environmental review. No one at any of our regulatory agencies is promulgating any safety standards. Regulatory standards may have been advanced from time to time, but not safety standards. Those last two sentences should could give everyone pause.

When the first brain tumor cases started coming to the courts, the telecommunications industry funded the science which had predictably favorable outcomes for the telecommunications industry. Independently funded studies have come to different conclusions, and the majority of independently funded studies have suggested there a link between RF radiation and neurological, immunological, and/or endocrine abnormalities and diseases. The US government’s NIEHS recently completed a \$25 million study of rats and mice exposed to 2G technology – and the findings showed cell phone radiation caused health effects in the exposed rats and mice. Malignant schwannoma tumors found in the hearts of male rats suggested “clear evidence of carcinogenicity”. The malignant gliomas found in the brains of male rats were categorized as “some evidence of carcinogenicity.”

The firefighters of California did not need the NTP findings to tell them radiation next to their sleeping/working environment was dangerous. They have known since towers were activated near their stations, and if not in the line of fire, they have known since the findings of our 2004 California firefighter study were made public.

In 2001 I was asked by San Diego firefighters to write an appeal when cell towers were permitted for their station. I began hearing more and more stories of firefighters who literally could not function in the job that clearly establishes firefighters as the guardians of society. Once cell towers were activated on or adjacent to their stations, many of them could no longer function due to severe headache, inability to sleep, and foggy thinking. These are not symptoms we wish to see in our First Responders.

In 2004 I organized a SPECT brain scan pilot study of firefighters who has been exposed to a cell tower on their station for over five years. We found brain abnormalities in all firefighters tested. Attached is my 2013 filing with the FCC detailing this study.

In 2004 I co-authored Resolution 15 which was passed overwhelmingly by the International Association of Firefighters. Res. 15 urged a moratorium on the placement of cell towers on fire stations in the US and Canada. I then helped the Los Angeles IAFF locals as they aligned with law enforcement unions to fight FirstNET towers on their stations. I am currently following a brain tumor cluster in a California fire station with a wireless hub next door to their station.

The symptoms experienced by the firefighters who participated in the SPECT brain scan study were similar to firefighters in other stations who live in the shadow of cell towers. Yet specific to the men we studied, it is important to note all the men had passed rigorous physical and cognitive exams prior to being hired by the fire department. Their symptoms included:

- headaches
- extreme fatigue
- cognitive impairment
- anesthesia-like sleep where the men woke up for 911 calls “as if they were drugged”
- inability to sleep
- depression
- anxiety
- unexplained anger
- immune-suppression manifest in frequent colds and flu-like symptoms

Real life examples of these symptoms are best briefly characterized by:

- 1) Firefighters got lost on 911 calls in the town they grew up on several occasions.
- 2) In one instance, four firefighters sat in the rig in a stupor with the alarm sounding in the background, unable to remember how to start the engine.
- 3) A medic with 20 years of experience who had never made a mistake forgot basic CPR in the midst of resuscitating a coronary victim.

The brain scans of these six men revealed a pervasive, hyper-excitability of the neurons in certain parts of the brain. These findings suggested the exposure to RF (microwave) radiation was causing the neurons to continually fire in these areas without benefit of rest. When neurons (brain cells) cannot rest, they ultimately die. The scans further revealed that other sections of the brain that should have been functional showed hypoperfusion, or decreased blood flow, suggesting impairment in these particular areas.

The firefighters most important lesson to us as a state, and as a nation, may be that if we allow a buildout of cell towers such that they are as commonplace in front of homes and schools as they are now on fire stations, we may be facing a tsunami of Alzheimer’s and dementia.

The rate of people dying from Alzheimer's disease in the United States rose by 55% over a 15-year period according to new data from the Centers for Disease Control. The direct and indirect costs to the state for Alzheimer’s and a host of related neurological and immunological diseases could be catastrophic for not just California, but for the nation.

Clearly the state honored the sacrifice of California’s firefighters and is concerned about the health risks they face from cell towers, having granted an exemption to them in AB 57 and SB 649. Yet firefighters are the strongest of the strong. What does that imply for the rest of us?

The position taken by the Sierra Club is going to be an important commentary on environmental review and local control as we go forward in the 21st century. As strongly as the Telecommunications Act of 1996 fosters expansion for the wireless industry, Section 704 of the

TCA does guarantee local control within certain parameters. To suddenly, after more than two decades of allowing a certain amount of local control, completely eliminate the right of local governments to decide their own environmental fate flies in the face of some fundamental American rights. We can, and we must, do better.

In 2002, I was invited by the County of San Diego to become a member of the newly formed Cell Tower Ordinance Siting Committee. We came up with a four tiered ordinance that imposed restrictions and permit requirements on the construction and location of cell towers. We had preferred locations such as industrial zones where low-visibility structures were preferred as opposed to larger towers in residential zones. We were trying to give the telecommunications industry the right to have coverage without encroaching in residential neighborhoods. Schools and residences were to be placements of last resort.

Sprint sued the County of San Diego. There were multiple appeals and ultimately a three-judge panel hearing was granted by the Ninth Circuit Court of Appeals. In *Sprint vs San Diego* the judges concluded that the Ordinance did not effectively prohibit Sprint from providing wireless service. Therefore the [Telecommunications] Act did not preempt the County's wireless telecommunications ordinance with its four tiered order of preferred priority.

From the perspective of having been on the planning committee, and having read the opinion of the Ninth Circuit, the merits of local control made abundant sense. The San Diego Ordinance did not make either side extraordinarily happy, but that often means the judges have done a good job. Those who wanted to limit cell towers were frustrated because their hands were tied by the TCA. The telecom industry was frustrated because they had to deal with local control issues, and as long as they could cover neighborhoods without actually entering into those neighborhoods, our San Diego Ordinance forced them to do exactly that. We forced the industry to look for alternatives.

To do away with local control and environmental review strikes me as not just un-American but unwise, given the thousands of studies showing biological effects from radiofrequency (wireless) radiation, given the abnormal SPECT brain scans from the firefighters who had only a five-year exposure that was not 24/7, but rather three days/nights a week, and given the untested nature of this newest generation of wireless, 5G, which is simply another wireless application but not a necessity for life.

The millimeter wave that will be carrying 5G data was once thought to be too weak to enter people's homes. Then the telecom industry came up with a way to boost it, and they created software that would allow 5G millimeter waves to penetrate through almost any barrier. These waves will come through brick and mortar into your living rooms and bedrooms and that is where they will be 24/7 – untested, virtually unregulated, with no limit as to how many 5G towers end up on the lamppost outside your home.

The firefighters of California have carried that message to Sacramento, and I am respectfully asking the Sierra Club to carry this message to Washington DC and suggest a moratorium on the legislative removal of the usurpation of local control and environmental review for siting cell towers. Too many rights have been taken away with recent bills that passed Congress, ushering

in the deployment of millions of cell towers across the nation. The firefighters asked the state of California to exempt their stations from 5G so that they could better protect the people they serve, and so they could protect their own lives and well-being.

It would be prudent and noble and for the Sierra Club to ask for a rollback of recent legislation that may have been ushered through with too little thought to the legacy we leave.

Respectfully,

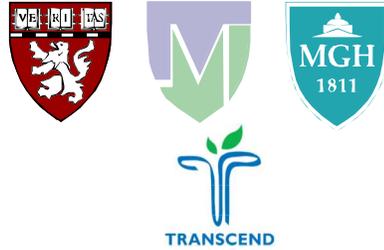
/s/ Susan Foster

SUSAN FOSTER
U.S. Adviser, Radiation Research Trust
Honorary Firefighter, San Diego Fire Department
Medical Writer

Attachment: FCC Comments SDF 9-2-13

HARVARD MEDICAL SCHOOL

Martha R. Herbert, Ph.D., M.D.
Assistant Professor, Neurology
Director, TRANSCEND Research Program
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9 September 2016

District Office
200 Douglas Street
Petaluma, California 94952

Dear Petaluma City School District,

I am a pediatric neurologist and neuroscientist on the faculty of Harvard Medical School and on staff at the Massachusetts General Hospital. I am Board Certified in Neurology with Special Competency in Child Neurology, and Subspecialty Certification in Neurodevelopmental Disorders. I have an extensive history of research and clinical practice in neurodevelopmental disorders, particularly autism spectrum disorders. I have published papers in brain imaging research, in physiological abnormalities in autism spectrum disorders, and in environmental influences on neurodevelopmental disorders such as autism and on brain development and function.

A few years ago I accepted an invitation to review literature pertinent to a potential link between Autism Spectrum Disorders and Electromagnetic Frequencies (EMF) and Radiofrequency Radiation (RFR). I set out to write a paper of modest length, but found much more literature than I had anticipated to review. I ended up producing a 60 page single spaced paper with over 550 citations. It is available at http://www.bioinitiative.org/report/wpcontent/uploads/pdfs/sec20_2012_Findings_in_Autism.pdf and it was published in a revised and somewhat shortened form in two parts in the peer reviewed indexed journal Pathophysiology (2013).

More recently I published an article entitled "Connections in Our Environment: Sizing up Electromagnetic Fields," in Autism Notebook Spring 2015 edition. In this article I describe how there is a whole series of problems at the cellular, sub-cellular and metabolic levels and immune levels that have been identified in autism. And interestingly, for every single one of those problems, there's literature about how EMFs can create those kinds of problems.

The argument I made in these articles is not that EMF is proven to cause autism, but rather, that EMF can certainly contribute to degrading the physiological integrity of the system at the cellular and molecular level – and this in turn appears to contribute to the pathogenesis/causation not only of autism but of many highly common chronic illnesses, including cancer, obesity, diabetes and heart

disease.. Please see this article on page 24-25 at the link <http://virtualpublications.soloprinting.com/publication/?i=252361>

In fact, there are thousands of papers that have accumulated over decades –and are now accumulating at an accelerating pace, as our ability to measure impacts become more sensitive – that document adverse health and neurological impacts of EMF/RFR. Children are more vulnerable than adults, and children with chronic illnesses and/or neurodevelopmental disabilities are even more vulnerable. Elderly or chronically ill adults are more vulnerable than healthy adults.

Current technologies were designed and promulgated without taking account of biological impacts other than thermal impacts. We now know that there are a large array of impacts that have nothing to do with the heating of tissue. The claim from WiFi proponents that the only concern is thermal impacts is now definitively outdated scientifically.

Radiofrequency electromagnetic radiation from WiFi and cell towers can exert a disorganizing effect on the ability to learn and remember, and can also be destabilizing to immune and metabolic function. This will make it harder for some children to learn, particularly those who are already having learning or medical problems in the first place. And since half of the children in this country have some kind of chronic illness, this means that a lot of people are more vulnerable than you might expect to these issues.

Powerful industrial entities have a vested interest in leading the public to believe that EMF/RFR, which we cannot see, taste or touch, is harmless, but this is not true. Please do the right and precautionary thing for our children.

I urge you to opt for wired technologies in Petaluma City School District classrooms, particularly for those subpopulations that are most sensitive. It will be easier for you to make a healthier decision now than to undo misguided decisions later.

Thank you.

Sincerely yours,

A handwritten signature in black ink, appearing to read 'Martha Herbert', with a long horizontal flourish extending to the right.

Martha Herbert, PhD, MD

September 08, 2017

The Honorable Jerry Brown
Governor, State of California
c/o State Capitol, Suite 1173
Sacramento, CA 95814

RE: SB 649 (Hueso) – Small Cell Wireless Facilities

Honorable Governor Brown,

I have recently learned of proposed Bill SB 649 regarding the streamlining of small cell wireless facilities.

As a member of the Physics department of Ariel University, and before that the Hebrew University of Jerusalem, I have studied the subtle effects of electromagnetic radiation on biology and biological materials. I have published more than 50 articles in the field of Dielectrics (the study of the interaction of materials with radio waves), including many on the interaction of cellular frequencies with biological materials such as proteins and blood. My last article investigated the interaction of 5G electromagnetic radiation with human skin.¹ One could argue that I have a certain amount of expertise.

In light of our work and a growing number of publications showing the frequency range of 5G can have serious biological effects, we believe that current efforts to accelerate the implementation of 5G should be delayed until additional studies are made to assess the critical impact on human health.

It is not for me to lecture to elected officials on how cities should develop technologically, nor is it for me to try and stop the juggernaut that is the cellular industry. However, I would like to point out to you important information on the possible public health implications of the explosion in unregulated cellular phone and wireless device use.

The term “health” has never featured too heavily in the lexicon of the Cellular Industry. It has been assumed, conveniently, that any possible effects on the human anatomy from the use of cell phones would be only mild heating. And that this is something that the body could easily deal with. As a consequence, the governing safety limits were set in 1998 by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) based on the premise that if radiofrequency radiation limits protected human tissue from overheating, then the public was adequately protected. They considered that the effect to humans would at most cause the agitation of water inside cellular tissues that would dissipate as heat, similar to what a microwave oven does, but at far lower energies.

The trouble is that our knowledge has progressed in the last 19 years and we now understand that the interaction of microwave energy and our tissues is far more subtle. There is increasing evidence of non-thermal biological consequences arising from our interaction with cellular phone radiation. A few examples; in 2014 a team from the University of Exeter, UK published a report linking the effect of

¹ Betzalel, Noa, Yuri Feldman and Paul Ben Ishai. “The Modeling of the Absorbance of Sub-THz Radiation by Human Skin.” *IEEE Transactions on Terahertz Science and Technology* PP.99 (2017): 1-9. [doi: 10.1109/TTHZ.2017.2736345](https://doi.org/10.1109/TTHZ.2017.2736345).



cellular phones on declining sperm quality.² They based their research on over 1492 subjects from around the world. In 2009, Columbia University showed that radio frequencies were leading to stress in living cells.³ This in turn seriously affects their ability to perform, as particular cellular pathways were disrupted. Further evidence along this direction was provided by a group from the University of Rennes.⁴ I can add plenty more examples, but I think that it is summed up by a recent public announcement. Advisors to the World Health Organization International Agency for Research on Cancer (WHO/IARC), themselves well versed in radio frequencies and in cancer, have publicly stated that evidence has been met to classify cellular radiation as meeting scientific criteria for a Group 1 carcinogenic agent to humans.^{5,6}

As I said above, it is not my job and neither is it realistic for me to stop the placing of thousands of antennas throughout your state. But it is my job to point out the health hazard to you before you make such a momentous decision.

Yours sincerely



Dr. Paul Ben Ishai
Department of Physics
Ariel University

CC
Tom Dyer, Chief Deputy Legislative Affairs Secretary

² Adams, J.A., et al. "Effect of mobile telephones on sperm quality: a systematic review and meta-analysis." *Environment International* 70 (2014): 106-12. [doi: 10.1016/j.envint.2014.04.015](https://doi.org/10.1016/j.envint.2014.04.015).

³ Blank, M. and R. Goodman. "Electromagnetic fields stress living cells." *Pathophysiology* 16.2-3 (2009): 71-8. [doi: 10.1016/j.pathophys.2009.01.006](https://doi.org/10.1016/j.pathophys.2009.01.006).

⁴ Habauzit, Denis, et al. "Transcriptome analysis reveals the contribution of thermal and the specific effects in cellular response to millimeter wave exposure." *PLoS One* 9.10 (2014): e109435. [doi: 10.1371/journal.pone.0109435](https://doi.org/10.1371/journal.pone.0109435)

⁵ "Cancer Expert Declares Cell Phone and Wireless Radiation As Carcinogenic to Humans." Environmental Health Trust (2017). <https://ehtrust.org/cancer-expert-declares-cell-phone-wireless-radiation-carcinogenic-humans/>

⁶ Carlberg, Michael and Lennart Hardell. "Evaluation of Mobile Phone and Cordless Phone Use and Glioma Risk Using the Bradford Hill Viewpoints from 1965 on Association or Causation." *BioMed Research International* 2017 (2017): 9218486. [doi: 10.1155/2017/9218486](https://doi.org/10.1155/2017/9218486).

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July 6, 2017

VIA PRIORITY MAIL and/or HAND DELIVERY and/or EMAIL

Assemblymember Marc Levine
5135 State Capitol
Sacramento, CA 95814

Re: Mass casualties are likely in District 10 from passage of SB 649

Dear Assemblymember Levine,

Senate Bill 649, a decision now before you, will likely result in mass fatalities in your District including children, who due to skull development levels and other factors, are more subject than adults to the effects of the carcinogenic cellular radiation which will saturate the homes in your District if this Bill is passed. Like you, I disdain inflammatory phases as such are so often deployed by emotionally over-loaded people with incomplete capture of the facts and science. Yet, directly relevant to SB 649, the Toxicology Program of our federal National Institutes of Health has shown through their \$25 million study, as announced on May 27, 2016, that cellular wireless radiation affects human tissue via non-thermal means and the formation of glioma, the cancer cell which results in glioblastoma (the brain cancer that kills people). Brain cancer killed four of my colleagues and friends which is what led me several years ago into dedication to our work educating consumers about smartphone proximity through www.greenswan.org. SB 649 is not about smart phone proximity but the constant radiation from the 50,000 towers from SB 649 presents a moral necessity to oppose this Bill. SB 649, now pushed by an industry which makes huge donations and contributions, is being advocated to wirelessly supplant cable as a main means of delivering TV, et al. Senate Bill 649 should be stopped in its tracks in order to protect the residents of your District. At the very least, SB 649 should be put on hold pending further study, as our federal Senate decided regarding the federal version of the same Bill, called S-19, pending further study.

As a trial lawyer, I have specialized in engineering and scientific proof civil cases since 1983. As nearly as I can tell I've personally handled approximately 1,600 civil cases, including certified class actions like the Chevron aviation gasoline matter (new engines for 1647 aircraft), the Mobil Oil AV-1 matter (overhauled or replaced engines for 850 aircraft, mostly twins), and I served as part of the plaintiffs' team in the Yuba Flood Cases, which after far too long settled against the State for \$423 million, as well as many hundreds of other cases, some of them also involving large groups of plaintiffs. I am not important, or by contemporary standards wealthy. Like you, I want facts, not hot-headed opinion from

some alarmist. Rather, our opposition to SB 649 is not grounded in emotion, but strongly grounded in science. If this Bill is allowed to be passed by our Assembly and is then signed into law, mass Crimes Against Humanity will likely result due to radiation exposure, **as you are hereby notified and warned**. Dated May 23, 2017, a 14 page submission on this subject was made to the already-overworked Senate Appropriations Committee, which presentation was composed of a detailed and annotated letter over my signature and supported by a Declaration under Penalty of Perjury by Mr. Paul McGavin. Paul and I are mere two of the large of California residents who, like representatives of cities and counties, oppose SB 649. Rather than taking up your time with more of my own words, and having given you this legal Notice of the likely consequences from the passage of SB 649, I respectfully advise you of said letter submitted to Senate Appropriations to your attention, and hereby incorporate that May 23rd Appropriations letter herein by this reference as though more fully set forth. Copies of that letter and Declaration should be immediately available to you from Senator Lara's office if you so request. I note in closing the additional factor that if SB 649 becomes law in California, the State will face ruinous financial loss from the resulting ADA complaints, all as set forth in that incorporated letter. **A selection of sources for your study is listed below**. Thank you.

Very truly yours,



Harry V. Lehmann

A small selection of articles and sources related to non-ionizing radiation and health:

<https://ehtrust.org>

<http://scientists4wiredtech.com>

<http://scientists4wiredtech.com/2017/03/rfr-hazards/>

<https://www.niehs.nih.gov/news/newsletter/2016/6/science-highlights/cellphones/index.htm>

<http://www.motherjones.com/environment/2016/05/federal-study-links-cell-phone-radiation-cancer/>

<http://www.cbc.ca/news/cell-tower-radiation-harmful-to-humans-study-1.958047>

<https://www.wsj.com/articles/cellphone-boom-spurs-antenna-safety-worries-1412293055>

<http://www.latimes.com/business/la-fi-cellphone-5g-health-20160808-snap-story.html>

12 September 2017

All School Board Members
Hempfield School District

Dear Sirs/Madams:

I am a public health physician who has been involved in issues related to electromagnetic fields (EMFs) for several decades. I served as the Executive Secretary for the New York Powerline Project in the 1980s, a program of research that showed that children living in homes with elevated magnetic fields coming from powerlines suffered from an elevated risk of developing leukemia. After that project was completed I served as the spokesperson for New York State on issues related to both power line and radiofrequency EMFs. I served as Director of the Wadsworth Laboratory of the New York State Department of Health, as well as Dean of the School of Public Health at the University at Albany/SUNY. I have edited two books on effects of EMFs, ranging from low frequency fields to radiofrequency/ microwave radiation, or the kind emitted by WiFi routers, cell phones, neighborhood antennas or cell towers and wireless computer equipment. I served as the co-editor of the BioInitiative Report 2012 (Bioinitiative.org), a comprehensive review of the literature showing biological effects at non-thermal levels of exposure, much of which has since been published in the peer-reviewed journal, *Pathophysiology* (attached). Also, I served on the President's Cancer Panel that examined radiation exposures as they relate to cancer risk, in 2009. Thus, this is a subject which I know well, and one on which I take a public health approach rooted in the fundamental principle of the need to protect against risk of disease, even when one may not have all the information that would be desirable.

There is clear and strong evidence that intensive use of cell phones increases the risk of brain cancer, tumors of the auditory nerve and cancer of the parotid gland, the salivary gland in the cheek by the ear. The WHO's International Agency for Research on Cancer has classified the radiation from both cell phones and cell towers as a Class 2B "Possible Carcinogen" in 2011. Cell towers use similar radiofrequency radiation as cell phones (in the 1.8 to 5.0 GHz range). The difference between a cell phone and a cell tower environment, however, is that while the cell phone is used only intermittently, and at higher power, a cell tower environment is continuous, serving many people at the same time. Cell towers direct their beam in all directions, such that anyone nearby is continuously exposed to radiofrequency radiation. While the intensity is much less than one would receive holding a cell phone to your head, the emissions from a cell tower are continuous. Thus the aggregate exposure over time coming from being close to a cell tower can be very significant. A child in a school with a nearby cell tower will be exposed every moment he or she is at school. Thus there is a particular concern when a cell tower is placed near to a school.

The latency for development of cancer after exposure to radiofrequency radiation is long, often up to 20 years for brain cancer. Thus the effects of exposing children will not be seen immediately but they will be elevated risk of cancer for many years to come.

Unfortunately cancer is not the only disease of concern. Radiofrequency electromagnetic fields are well documented to reduce male fertility. The last thing one wants for boys in an elementary school is to have them grow up and not be able to reproduce. Furthermore and more immediately there is increasing recognition of the fact that some people, including children, are exceptionally sensitive to electromagnetic fields, and show the syndrome of electro-hypersensitivity. This is characterized by headache, 'brain fog' and reduced ability to learn, often accompanied by nausea and gastrointestinal and cardiovascular symptoms. This is certainly not something that one wants to have occur, even if only in some students, in a school where they come to learn.

Placement of cell towers should be as far as possible from any place where humans are present. Certainly having a cell tower near to an elementary school is dangerous to the health of every child attending the school.

Yours sincerely,

A handwritten signature in blue ink that reads "David O. Carpenter". The signature is fluid and cursive, with a long horizontal stroke at the end.

David O. Carpenter, M.D.
Director, Institute for Health and the Environment
University at Albany

Alliance of Nurses for Healthy Environments



June 26, 2017

The Honorable Cecilia Aguilar-Curry,
Chair Assembly Local Gov't Commission
Room 157, 1020 N Street Sacramento,
CA 95814

RE: SB 649 (Hueso) – Small Cell Wireless Facilities - - OPPOSE

Dear Chair Aguilar-Curry:

I am a Professor of Public Health at the University of San Francisco and a Board Member of the national Alliance of Nurses for Healthy Environments. I am very concerned about moving forward with expanding the use of small-scale wireless technologies at the same time that there is mounting evidence of the potential for health risks from the associated radio frequency energy and radiation, particularly to children. The Alliance of Nurses for Healthy Environments ascribes to the precautionary principle as it applies to human health. We firmly believe that early warnings in the scientific literature should be heeded and that our policy development should reflect the synthesis of the best and latest scientific evidence.

At this point in time, we oppose SB 649 and believe that we need an exhaustive review of the science before we allow significant expansion of small cell wireless facilities, such as those to facilitate 5G networks. The results of the literature review should inform our policies. We must be sure that vulnerable populations such as pregnant women and young children will not be unduly harmed from their proximity to unnecessary radio frequency energy. It is important that we continue to examine what constitutes a safe distance and how we can continue to pivot when more information becomes available. We are concerned that the passage of SB 649 will entrench us in a policy for which we have insufficient assurances and which, if passed, will require the burden of effort to reverse.

For these reasons, we oppose SB 649 and urge a “no” vote in the Local Government Committee.

Thank you for considering our concerns.

Sincerely,

Barbara Sattler, RN, MPH, DrPH, FAAN
Board Member

July 26, 2017

The Honorable Ben Hueso
Member of the California State Senate
Room 4035, State Capitol
Sacramento, CA 95814

RE: SB 649 (Hueso) – Small Cell Wireless Facilities - OPPOSE

Dear Senator Hueso:

Environmental Working Group (EWG) respectfully opposes your SB 649, which would make the installation of small cell wireless facilities, such as those used to facilitate 5G networks, ministerial rather than discretionary at the local government level.

The health impacts of cellular transmissions have been debated for over ten years because there are studies that raise real concerns about the effects of radio frequency radiation on humans. This is why EWG sponsored two bills by former Senator Leno, SB 1212 (2010) and SB 932 (2011) that would have required sellers of cell phones to inform consumers to minimize exposure to cell phone radiation by reading the manual that comes with the phone, as this is in fact recommended by cell phone manufacturers in their included manuals.

Studies on the health impacts of cell phones and their transmission infrastructure are continuing, but there is already adequate existing sound science for government to proceed with caution on the roll-out of the new technology. In particular, the results of the \$25 million National Toxicology Program study (2016) that showed tumors in rats caused by a typical amount of heavy cell phone use are to be reckoned with. And, most of the past science has analyzed older cellular technology like 2G and 4G, so we are moving into uncharted waters with 5G with its different wavelengths and energy levels.

Local governments must be able to evaluate science and respond to the wishes of their citizens and neighborhoods before permits are issued for this technology and SB 649 short-circuits that process. This includes important decisions about locating the technology near homes, schools, and hospitals. We simply cannot rely upon the word of the FCC (in terms of safety standards) to protect the health of Californians.

For these reasons, EWG will be urging a “no” vote for the Assembly floor. We will be writing a separate letter to the Assembly Appropriations Committee on fiscal concerns.

Sincerely,



Bill Allayaud
California Director of Government Affairs
Environmental Working Group

A summary of current U.S. and international regulations on microwaves related to cell towers

Prepared By
Dr. Joshua Dennis Booth, PhD
July 2017

I am writing this report as a knowledgeable voice for the School Board, parents, and residents of the East Hempfield school district with regard to the placement of cellular towers at Rohrerstown Elementary School and Centerville Middle School. My knowledge comes from my experience with EMP-Microwave radiation, as outlined in the Personal Background section at the end of this document. I'm also a resident of the Hempfield School District community: both a parent concerned about health issues and a homeowner concerned about property value. The numbers used here for comparison are those given for the Rohrerstown Elementary Tower at the zoning board hearing on June 19th, 2017. This report is outlined as follows. First, I give an overview of the current U.S. laws and agencies related to microwaves, cellular tower, and other common microwave devices. Second, I provide an overview of non-U.S. laws related to microwaves. The second section serves to demonstrate the most important message of this report by showing the outdated nature of U.S. regulation, and why we should be concerned about these towers being at the distance and magnitude that is being proposed by the tower's developers.

Section 1, Background, Current U.S. regulation for key microwave devices.

In this section, I provide background about both microwaves in general and cell technology. Microwaves are electromagnetic waves that vary in frequency between 300 MHz (i.e., near Radio) to 300 GHz (i.e., near infrared). At ~70-100 MHz the body maximally absorbs energy and at 3,000 MHz the energy is concentrated at the body surface. This is why there are regulations about things like radio towers but not standard household lights. Cell towers use frequency between 900MHz to 1900MHz. These waves can also vary in strength too, and this is the real issue that will be addressed in the report. In order to accommodate these variables, a measurement of power density is often used. Here, we will use the units of $\mu\text{w}/\text{cm}^2$ for all examples as this is the unit given to use by the cellular tower developers, though other areas use other units. Note, the Federal Communication Commission (FCC), which is responsible for microwave regulation in the US, uses a different unit of mw/cm^2 for their Maximum Permissible Exposure (MPE)[1]. Their proposed tower will have a power density of a maximum of $3.6\mu\text{w}/\text{cm}^2$. I note as someone that has done the calculations myself that this maximum is slightly higher than what most likely will be the power density on day one. This view was also shared by the cell tower developers at the zoning hearing. However, this density may increase in the future without notice if they sell broadcasting to other cell vendors or place higher wattage/gain equipment. More importantly, the **duration of exposure** is one of the largest issues up for debate in research. For students, this would be the whole time they are on campus for class and activities: seven school years, from K to 6th grade.

Let us first address the FCC and the current standards set forth by the FCC for cellular towers. The FCC is an independent agency formed in 1934 to regulate interstate communications. The FCC is funded entirely by regulatory fees paid by radio, cell, cable, television, and satellite companies for access to certain bandwidth in areas [4]. They have most notably been in the news

of late because of concerns of net neutrality in which internet companies may sell user's data. The only health concerns they regulate are those related to radio waves. The first standards were issued by the nonprofit American National Standards Institute (ANSI) in 1982. This was one year before the first commercially available cell phone was approved by the FCC in 1983. It took until 1985, when the FCC finally adopted the ANSI standard of 1982. This standard was issued in a maximum absorption of 4Watts/kilogram. In 1992, ANSI/IEEE revised the 1982 standards. These revisions considered a larger frequency and restricted environmental radio frequency exposure. They also added the concepts of "controlled" and "uncontrolled" environments. Here the "controlled" is a location where "there is exposure that may be incurred by persons who are aware of the potential for exposure..." (e.g., work environments) [5]. More important, they started to consider the duration of a single exposure: the "controlled" being an average of 6 minutes and "uncontrolled" being an average of 30 minutes. Note they do not make mention of time between these exposures but only the average exposure for a length of time. Though the FCC was given notice of these changes in 1992, the FCC only made full requirements in mid 1996. These standards state that the "controlled" power density in the 30-300 MHz should be less than 1,000 uW/cm². The "uncontrolled" standard is 200 uW/cm² [5]. Cell towers must only follow the "controlled" standard as they are a known structure that can be avoided [5]. Though groups have lobbied to change this standard, **the standard has not been updated for the past twenty-one years.** One government agency that has spoken up about this is the United States Department of Interior. This department wrote a formal letter in 2014 pointing out that the FCC regulation is outdated, and the department believes that the frequency limits are already having a negative impact on animals in the environment [8]. Recent updates to the FCC consumer website recommend MPE be 580 uW/cm², but this value has not been updated in their human exposure manuals [3].

Microwaves have transformed the way we live in today's world, and cell technology is only one area in which microwave research is being conducted and regulated. Therefore, it makes sense to understand microwaves being regulated and studied in other areas, e.g., microwave ovens, full body airport scanners, and WiFi routers.

Microwaves were first researched by the radiation given off of vacuum tubes, and were aimed at radar search. By chance, an engineer named Percy Spencer working for Raytheon Corporation was exposed without knowing possible side effects to microwaves. The microwaves ended up melting food in his pocket, and the microwave oven was born. Years after the first microwave ovens were made available for use, the Radiation Control for Health and Safety Act of 1968 limited the amount of microwaves that could leak from the device to 10,000 uW/cm² at 5cm (~1.97 inches) away from the oven. Two years later, this was reduced to 1,000 uW/cm² at 5cm by the U.S. Bureau of Radiological Health (i.e., a limit similar to FCC's human exposure manual), and only 5,000 uW/cm² over the device's whole lifespan [9] (up to 10 years)! This lifespan limit is only three years greater than what a student would be exposed to over the whole time from grades K-6. In fact, **the power density of the proposed Rohrerstown Elementary campus tower would be similar to having a child sit at about 12 feet away from a running 600 Watt Microwave oven all day, every school day for seven years.** However, we should note that the frequency of a microwave oven is much higher, i.e., about 2450 MHz.

Body scanners at airports are the most recent area where microwaves have cropped up in daily life. Most of the first-generation body scanners were “back-scatter” type that used low dose of x-rays [10,11]. These have actively been replaced by new millimeter scanners that use microwaves. These new millimeter scanners expose the person to approximately .01uW/cm² to .6 uW/cm² at various frequencies inside the microwave frequency spectrum for less than 6 seconds [11]. Despite the very low exposure and removal of detailed body images, passengers may opt for a pat-down, and **young children are not required to be scanned**. This demonstrates TSA wanting to take reasonable health precautions for the general public.

The most common place where we find microwaves is as radiation from WiFi routers. These devices are located in almost all places from coffee shops to doctor offices. Currently, the only regulation that the FCC has placed on such devices is a maximum strength as not to disrupt others and not allowing for signal blockers[1,2]. These devices have frequency 2400 MHz band that is close to a microwave oven. Note that this is why your microwave oven may interrupt your WiFi router at times. These devices have high power density in close range, but the power density reduces by the square of the distance resulting in low power density far away. For example, at about a tenth of an inch from the device, the power density is about 2.65 uW/cm². At about 3.3 feet away, the power density is only .24 uW/cm². **The proposed tower at Rohrerstown Elementary School will have a power density that is about 1.4x stronger than such a router, the equivalent of having a child with about one-and-a-half live WiFi routers directly beside them every school day for seven years. Imagine placing one and a half powered-on WiFi routers under your child’s pillow every school night for seven years. Given the health concerns regarding microwaves, this is not likely an action you would choose to take.**

Section 2, Current Non-US regulations.

In this section, I provide an overview of the regulations on microwaves and cell towers in other modernized countries. Through these examples, I demonstrate that the U.S.’s twenty-one-year-old protection standards lag behind those more recently updated in other countries. Moreover, we have seen in the previous section that the FCC has been slow to update its protection standards even when pressured by large groups of engineers and scientists like ANSI and IEEE. Here we will see the more proactive approach that other countries are taking to protect their residents with regard to microwave public health.

I first point out the World Health Organization (WHO) that sets forth protection standards in hopes that all countries will adhere to a minimal standard of 900 uW/cm² for cellular towers. The FCC’s 1996 standard lags behind the World Health Organization’s protection standard by 100 uW/cm². Our neighbor Canada’s protection standard is now 300 uW/cm² in developed areas. The FCC exceeds this protection standard by 3.33x! Next, two countries that I will point out are Russia and China. I selected these two countries because of their history of lack of environmental and health safety regulations. Both countries have a maximum MPE of 10 uW/cm² [12]. This value represents 100x less radiation than allowed by the FCC. Though the proposed cell tower at Rohrerstown Elementary School would be allowed by this standard, it would already be 36% of the maximum. If the proposed tower is placed without regulation from the school, the proposed tower’s power density could easily exceed this limit with new

equipment or selling access to other cell providers. As we move into Europe, the regulation limits become even greater. The cause of the lower limits in Europe is because of research coming from the Precautionary Principle expressed by most countries [7], the BioInitiative reports [13], and the European Union Science and Technology Options Assessments (STOA) of 2001. The BioInitiative report of 2012 recommends an extremely low power density of .0006 uW/cm², and the STOA recommending a maximum of .01 uW/cm². It is important to note that almost no country or cell towers meet these recommendations. However, the WHO- International Agency for Research of Cancer (IARC) has classified radio frequency electromagnetic as a **possible carcinogenic to humans** based on studies related to the development of malignant types of brain cancer in humans from cell phone use in 2011 [6]. These items are almost completely ignored by US regulation committees at this time, even though millions of dollars in damages from both the land owners and cell tower owners have been paid out all over Europe. If these reports become allowable by U.S. courts, the school district itself may be open to lawsuits. Mountainous countries, such as Switzerland, Lichtenstein, and Luxembourg, have set current rules at 9.5 uW/cm² [12], and are currently reviewing lowering limits more. More populated countries have set even lower standards on a single frequency, such as Italy's regulation of .1 uW/cm². Other major countries like Germany and France are securing health in a different manner. While France does allow for power density between 455-955 uW/cm² (i.e., lower by as much as 2x the U.S.'s 1996 standard), they have put laws on where towers may be placed. By law in France, no cell towers may be placed on school property. Moreover, any citizen may have their home evaluated for cell tower radiation, and the public must be informed in order to vote if a tower should be placed [14,15]. India's Supreme Court in 2013 upheld that cell towers are a hazard to life, and the removal of all cell towers at schools, colleges, hospitals, and playground in the state of Rajasthan [16]. Other countries are following these steps as the Council of Europe recommended banning all cell phones from schools.

While TSA is about on par with body scanners as other governments, other countries have been far more protective about WiFi devices. In 2015, France has banned the use of WiFi in Nursery schools (i.e., children less than 3 years old). WiFi in schools with children up to age 11 years old may only be turned on for activities that need WiFi, and must be turned off when not in use [14,15]. Though not law, The Russian National Committee on Non-Ionizing Radiation officially recommended that WiFi should not be used in school in 2011 [18]. The Israeli Ministry of Education has issued guidelines banning WiFi in classroom prior to 1st grade and limiting use similar to France up to third grade [17]. **Recalling from last section, the proposed tower will have the same power density of about 1 and ½ standard WiFi routers next to the child's head. It seems that if we should be limiting WiFi in the classroom to when we need it, we should not, in essence, be strapping it to the head of a child.**

Recommendation.

As a resident of the East Hempfield and a member of the science community, I recommend taking precautions for our children from microwave exposure. This includes not situating a tower at Rohrerstown Elementary School or Centerville Middle School. For a more in-depth look at cell phones, policy, and current research, I recommend reading [7] in its full, and paying attention to the sections on children.

Personal Background of Joshua Dennis Booth:

I hold a BS in Applied Mathematics, MS in Computational Mathematics, and PhD in Computer Science and Engineering. I previously advised CDC/NIOSH as a Biostatistician intern while focusing on statistical databases. I was a Post Graduate Researcher for The Department of Energy's Sandia National Laboratories in Albuquerque New Mexico. There I worked in the department of scalable algorithms providing scalable linear solver solutions to large scale simulations for circuits, solid mechanics, and EMP-Microwave based applications. I have published work related to large numeric solvers, power systems, and low voltage computing algorithms. I am currently an Assistant Professor of Computer Science at Franklin & Marshall College. I am a member of SIAM, ACM, and IEEE.

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June 26, 2017

The Honorable Cecilia Aguilar-Curry, Chair
Assembly Local Gov't Commission
Room 157, 1020 N Street
Sacramento, CA 95814

RE: SB 649 (Hueso) – Small Cell Wireless Facilities - -OPPOSE

Dear Chair Aguilar-Curry:

Environmental Working Group (EWG) opposes SB 649 by Senator Hueso. This bill would make the installation of small cell wireless facilities, such as those used to facilitate 5G networks, ministerial rather than discretionary at the local government level.

The health impacts of cellular transmissions have been debated more and more passionately the last ten years because there are studies that raise real concerns about the effects of radio frequency (RF) energy or radiation on humans. This is why EWG sponsored two bills by former Senator Leno (SB 1212 in 2010 and SB 932 in 2011) that would have required sellers of cell phones to inform consumers that minimizing exposure to cell phone radiation is prudent and in fact recommended by cell phone manufacturers in their included manuals.

Studies on the health impacts of cell phones and their transmission infrastructure are continuing. As new information becomes available, local government ought to be able to use it to help guide their decision-making, including locational issues such as proximity to homes, school, and hospitals. EWG believes that allowing cities and counties to weigh the potential impacts of transmission networks before permits are issued for their construction is essential and SB 649 would prevent them from doing so. And, if more definitive health concerns arise, state law would have to be changed in order to give local governments the flexibility to do their due diligence.

For these reasons, we must oppose SB 649 and urge a “no” vote in the Local Government Committee.

Sincerely,



Bill Allayaud
California Director of Government Affairs
Environmental Working Group

cc: Senator Hueso

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September 13, 2017

Regarding the placement of cellular phone towers on school property in the Hempfield School District, I am concerned regarding the unknown effects of this amount of electromagnetic radiation so close to children. Numerous countries have placed limits on placement of these towers near schools. Some have banned them completely. The science is still evolving and there is some early evidence to suggest that the developing brains of children are at greater risk as they absorb much more of this electromagnetic radiation than adults. Industry support of studies showing no significant harm is worrisome. In reviewing other contracts Verizon has made with schools to place towers on their property, the \$1000-\$2000 per year a school may gain to their budget does not (in my opinion) make a significant reduction in school debt such that this would be worth the potential harm to children.

I worry the Hempfield School District is taking an unknown risk regarding the health of the children and families they serve for minimal financial benefit.

Perhaps working with families and business leaders to come up with alternative means of generating revenue for the district would be a safer and financially greater solution to the issue of decreased school district revenue and increased costs.



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