



Best Practices with Wireless Radiation for Schools--a Review of Global Advisories

(Preliminary Report updated 2/5/2015)

"Even though the radio frequencies that are emitted from current cell phone technologies are very weak they are able to activate the human brain."

-Nora D. Volkow, M.D.,

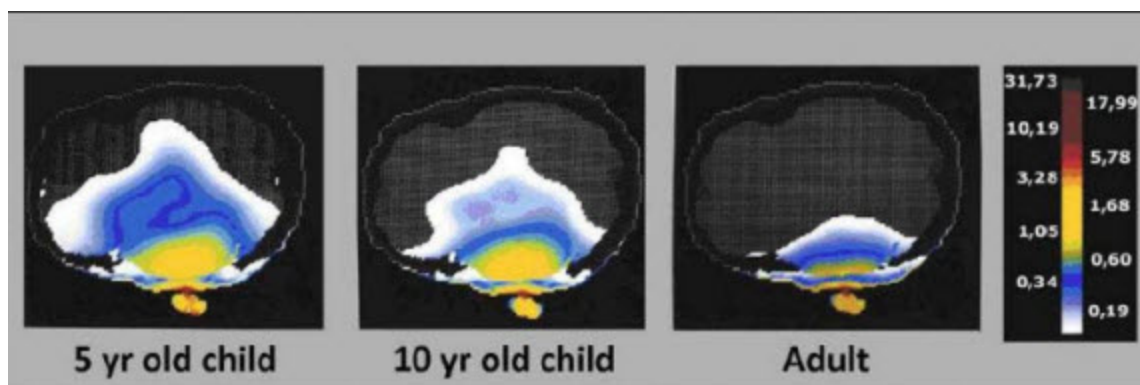
Director of the National Institute on Drug Abuse at the National Institutes of Health

"Three years ago the World Health Organization declared cellphone and other wireless radiation to be a possible human carcinogen, the same category as some pesticides, lead and engine exhausts. Since then evidence has mounted that such radiation can profoundly affect human biology, altering brain metabolism, damaging animals exposed during pregnancy and reducing sperm count. Before blanketing our preschools, kindergartens and middle schools with wireless radiation we need a full life-cycle assessment of economic and health costs and benefits of wireless technology."

**- Devra Davis PhD MPH, President of the Environmental Health Trust,
in her [Open Letter](#) to President Obama April 2014**

Click on blue lettering to access online resources and research

Children's Unique Vulnerabilities to Wireless Radiation



([Om P. Gandhi](#) et al., 2012)

The image above demonstrates the increased absorption of wireless radiation within the brains of children compared to adults. WIFI radiation has *never* been evaluated for its long term impact on the developing brain. Recent research is linking wireless with serious potential health effects.

"Children, however, are not little adults and are disproportionately impacted by all environmental exposures, including cell phone radiation. In fact, according to the International Agency for the Research on Cancer, when used by children, the average RF (radiofrequency) energy deposition is two times higher in the brain and 10 times higher in the bone marrow of the skull, compared with mobile phone use by adults...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."

– [Dr. Robert Block](#), **President of the American Academy of Pediatrics, 2012.**

Why are Children and the Developing Fetus More Vulnerable?

- Children have smaller heads with a shorter distance to brain centers.
- Children's skulls and ears are thinner allowing radiation to penetrate further.
- Children's brains contain more fluid and absorb more microwave radiation.

"Because the World Health Organization considers wireless radiation a possible human carcinogen, wireless radiation does not belong in schools with young children"

-**Anthony B. Miller MD PhD, expert advisor to WHO, Professor Emeritus University of Toronto in The [C4ST Women's College Hospital Symposium 9/12/14](#)**

Environmental exposures at critical periods has profound effects on fetal and childhood development.

- Children's nervous systems and immune systems are developing at a rapid rate.
- Brains are maturing through the early twenties.
- Children have more active stem cells which are shown to be more impacted by microwave radiation.

"As a research scientist and physician who studies how microwave radiation affects the outcomes of pregnancy, I am deeply concerned about growing exposures to cell phone and other wireless radiation."

- Prof. [Hugh Taylor](#), MD, PhD, Chief of Obstetrics/Gynecology at Yale University Medical School, 2013.

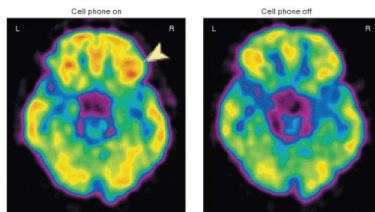
Health Risks

Wi-Fi is low level microwave radiation. Many published studies over the past 20 years have shown an array of serious biological effects from low level microwaves. DNA damage and disruption of the blood brain barrier (BBB) have occurred at levels hundreds of times lower than US exposure limits.

"A disservice has been done in inaccurately depicting the body of science, which actually indicates that there are biological effects from the radiation emitted by wireless devices, including damage to DNA, and evidence for increased risk of cancer and other substantial health consequences...The public the world over has been misled by this reporting."

Dr. Ronald B. Herberman, Founding Director of the University of Pittsburgh Cancer Institute, Vice Chancellor of Cancer Research at University of Pittsburgh.

Neurotoxic effects: Experimental research shows chronic exposure kills and reduces brain cells. 2011 [NIH research](#) found just 50 minutes of a wireless transmitting device (cell phone) next to the brain increases glucose in the part of the brain most exposed. Preliminary [3G](#) and [4G](#) research has shown that non-thermal levels of this radiation alter the brain's electrical activity.



[Volkow et al.](#), Journal of the American Medical Association, 2011

Cognition and Impaired Memory: Recent research at Yale University found prenatally exposed pups had impaired memory, increased hyperactivity and altered brains- consistent with a growing literature.

"We have shown that behavioral problems in mice that resemble ADHD are caused by cell phone exposure in the womb," said **Dr. Hugh Taylor of Yale Medical School**. "The rise in behavioral disorders in human children may be in part due to fetal cellular telephone irradiation exposure."

Behavioral Issues: Epidemiological studies have shown associations between exposures and behavioral issues in children. For example, a recent [study](#) showed a significant dose-response relationship between the number and duration of voice calls made on cell phones and ADHD risk among children exposed to lead in their environment.

Sleep: Research shows this radiation from wireless transmitting devices can impact sleep. For example, this radiation has been shown to [delay entrance](#) into deep non-REM sleep and decrease time spent in this stage of sleep. The quantity and quality of sleep has a profound impact on learning and memory. A sleep-deprived person cannot focus or learn efficiently. Sleep also has a critical role in the consolidation of memory essential for learning new information.

Genotoxic effects: Studies at non-thermal (no measurable temperature change) levels of microwave exposures show chromosomal instability, altered gene expression, gene mutations, DNA fragmentation and DNA structural breaks. Genetic mutations and cellular damage can potentially contribute to cancer growth.

Reproductive Impacts: Consistent evidence from experimental research, epidemiological studies and in vitro (cells) laboratory, and in vivo (animal) studies shows that RF exposure is associated with reduced sperm count, motility and concentration, as well as DNA damage and altered cell structure. Some research also shows damage to the ovaries of rats and mice and changes in the eggs of flies and birds.

Cancer: Research showing that long term heavy cell phone users have an increased risk of brain cancer lead to the WHO IARC classification of this radiation as a Class 2 B carcinogen: a “possible human carcinogen”. A study showed that adults who started using cell or cordless phones as teenagers had a 8-fold higher risk of brain cancer on the side of their head where they held the phone. To date, the only published study of children's' risk of brain cancer from cell phone use found more than a 2-fold risk after >2.8 years of use (from billing records), combined with a statistically significant trend of increasing risk with increasing year of use.

Hearing: Research shows chronic mobile phone usage results in high frequency hearing loss and inner ear damage . Research has also shown significant risk of tumors on the auditory nerve in the brain (acoustic neuromas).

Disruptions to Heart Functioning : Some research shows increases in heart rate, arrhythmias, dizziness, changes in blood pressure and other disturbances in heart functioning from wireless radiation.

Headaches: [Research](#) shows children who used cell phones or were exposed prenatally to wireless radiation are at higher risk of developing headaches.

Oxidative stress: Oxidative stress is the formation of tissue-damaging free radicals. Significant research shows wireless radiation increases oxidative stress which damages cells and their DNA through the production of peroxides and free radicals. Oxidative stress is implicated in the cause of many diseases such as cancer and Alzheimer's disease.

Scientific data on the biological effects of radiofrequency (RF) indicate the need to pursue a precautionary approach to protect the exposed population. It is clear that RF radiation can cause single and double strand DNA breaks at exposure levels that are currently considered safe under FCC guidelines. - **Dr. Martin Blank of Columbia University in his [letter](#) to the LAUSD.**

What will the long term impact be?

Would we let our children play with a known carcinogen?

What if this radiation is proven to be a carcinogen in thirty years?

“Neuronal damage may not have immediately demonstrable consequences, even if repeated. It may, however, in the long run, result in reduced brain reserve capacity that might be unveiled by other later neuronal disease or even the wear and tear of ageing. We can not exclude that after some decades of (often), daily use, a whole generation of users, may suffer negative effects such as autoimmune and neurodegenerative diseases maybe already in their middle age”. **Dr. Salford, Dr. Nittby, and Dr. Persson in [Effects of Electromagnetic Fields From Wireless Communication upon the Blood-Brain Barrier](#) in the Bioinitiative Report 2012 a scientific review of the science by 29 experts in ten countries.**

HARVARD MEDICAL SCHOOL

Martha R. Herbert, Ph.D., M.D.
Assistant Professor, Pediatric Neurology
Director, TRANSCEND Research Program
www.transcendresearch.org



MASSACHUSETTS
GENERAL HOSPITAL

Martinos Center for Biomedical Imaging
149 13th Street, Room 10.018
Boston, Massachusetts 02129
Phone: (617) 724-5920
Fax: (617) 812-6334

TO: Los Angeles Unified School District
FROM: Martha R Herbert, PhD, MD
RE: Wireless vs. Wired in Classrooms
DATE: February 8, 2013

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.

I recently 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/wp-content/uploads/pdfs/sec20_2012_Findings_in_Autism.pdf.

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.

EMF/RFR 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 problems in the first place.

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 step back from your intention to go wifi in the LAUSD, and instead opt for wired technologies, particularly for those subpopulations that are most sensitive. It will be easier for you to make a healthier decision now than to undo a misguided decision later.

Thank you.

A handwritten signature in black ink, appearing to read 'Martha Herbert'.

Martha Herbert, PhD, MD

Pediatric Neurology drherbert@autismwhyandhow.org Martinos Center for Biomedical Imaging
Massachusetts General Hospital, Harvard Medical School Boston, Massachusetts, USA

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

Dear Sirs/Madams:

This is concerning potential adverse health effects associated with exposure to radiofrequency (RF) radiation, specifically that from wireless routers. I am a public health physician who has been involved in issues related to electromagnetic fields (EMFs) for a number of years. I served as the Executive Secretary for the New York Powerline Project in the 1980s, a program of research which showed that children living in homes with elevated magnetic fields coming from powerlines suffered from an elevated risk of developing leukemia. I have edited two books on effects of EMFs, including RF radiation. I served as the co-editor of the Bioinitiative Report (www.bioinitiative.org), a comprehensive review of the literature on this subject. The public health chapter from this report was subsequently published in a peer reviewed journal, and that is attached. Also I testified before the President's Cancer Panel on this subject in 2009, and a publication coming from that testimony is also attached. Thus this is a subject which I know well, and one on which I take a public health approach that has as a fundamental principle the need to protect against risk of disease even when one does 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 evidence for this conclusion is detailed in the attached publications. WiFi uses similar radiofrequency radiation (1.8 to 5.0 GHz), although the intensity of exposure in the immediate environment is much lower than what one gets from holding a cell phone close to your head. The difference between a cell phone and a WiFi environment, however, is that while the cell phone is used only intermittently a WiFi environment is continuous. In addition WiFi transmitters are indoors, where people (and in this case, children) may be very close to them. There is evidence from Scandinavian studies of cell phone usage that children who use cell phones are about five times more likely to develop brain cancer than if use starts as an adult. Thus it is especially important to protect children.

To my knowledge there has not been any health investigation of individuals living or working in WiFi environments as compared to others who are not. However, because the radiation is the same as those for cell phones, there is every reason to assume that the health effects would be the same, varying only in relation to the total dose of radiation. Wired facilities do not generate any RF radiation. While there is not specific proof that WiFi increases risk of cancer, there is certainly no evidence that it is safe. I urge you to not put WiFi in any school. Children should not be put at increased risk of developing cancer.

Yours sincerely,



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

Best Practices

The Environmental Health Trust recommends that schools reduce exposure to children and staff to levels *as low as reasonably achievable (ALARA)*. Fiber optic/ethernet connections are the Best Practice technology solution for schools allowing for full internet access without radiation exposure.

“It is in the best interest of the District, its Board, and the children, teachers and staff the District protects to provide healthy and safe school environments... The Board should adopt programs to expand wired internet infrastructure and “EMF/RFR best practices” including the use of wired (CAT-6 or other), cable modem internet, or fiber optic connections instead that do not produce toxic exposures.”

-Cindy Sage, co-author of The [Bioinitiative Report](#), [Advice to the Los Angeles United School District](#).

Version 3.0 of the USA Northeast Collaborative for High Performance Schools Version Criteria Low-EMF Best Practices in the INDOOR ENVIRONMENTAL QUALITY Section (USA)

EQ 15.2.2 Wired local area network (LAN) to reduce RF EMF

· Install a wired local area network (LAN) for Internet access throughout the school. Provide wired network connections for desktop computers, laptops, notebooks, and tablets. All wireless transmitters shall be disabled on all Wi-Fi-enabled devices. Provide wired input devices for computer workstations.

EQ 15.2.3 Wired Phones to reduce RF EMF in classroom

· Install easily accessible hard-wired phones for teacher and student use and prohibit installation and use of standard DECT cordless phones and cordless phones operating at 2.4 GHz and 5.8 GHz unless they have been laboratory tested to demonstrate that the cordless phone base station and handsets (whether placed in the charging station or not) do not emit RF EMF emissions in standby mode.

· Prohibit the use of cell phones and other personal electronic devices in instructional areas / classrooms. Additionally, they shall be required to be powered off or be in airplane mode (sleep mode is not sufficient) except during fire-life-safety drills and incidents.

Examples of Schools Removing the WiFi

2014: [Portland Waldorf School](#), Portland Oregon, USA, WiFi removed.
2014: [Meeting House Montessori](#), Braintree Massachusetts, USA, WiFi replaced with ethernet.
2014: Ghent, Finland, [Wi-fi banned from pre-schools and day care](#).
2014: [UPPER Sturt Primary School](#), Australia “No WIFI” LOW EMF Policy
2014: The [St. Augustine School](#) in Italy turned off Wifi and goes back to Wires.
2013 [Winlaw Elementary School](#), B.C. Canada turned off WiFi.
2013 [Te Horo Primary School](#) New Zealand Replaced WIFI with cable-based internet.
2013 [Kootenay Lakes District](#) School Board BC (One school without Wi-Fi)
2013 [Blaise-Cendrars High School](#), Switzerland. Teachers vote to remove WiFi.
2012 [Kivioja primary school](#) in Ylivieska Finland bans phones and minimizes Wireless.
2012: [Halton Waldorf](#), in Burlington Vermont: Remaining free of Wireless Radiation
2011 [City of Lakes Waldorf School](#), WiFi taken out. Minneapolis, Minnesota USA
2011 Aurora School in Ontario removed Wifi and replaced with hardwired.
2011 [North Cariboo Christian School](#) in Quesnel, B.C., removed Wi-fi .
2011 [Pretty River Academy](#) in Ontario no WiFi.
2011 Wayside Academy, Peterborough, Ontario no Wi Fi.
2010 Surrey, [BC Roots and Wings Montessori](#) removed Wi-Fi.
2010 Ontario St. Vincent Euphrasia elementary school: Parents voted to turn off Wi-Fi.
2009 HEROUVILLE-SAINT-CLAIR wi-fi networks removed.

An Example to Consider

THE UPPER STURT PRIMARY SCHOOL WiFi and Wireless Devices Policy

Upper Sturt Primary School is committed to providing a safe and healthy learning environment for our children. Unprecedented long term exposure to wireless computer networks (WiFi) and wireless communication devices in school may present a potential health and safety risk or hazard for children and staff.

WiFi and wireless communication devices such as mobile phones and tablets use microwave radiofrequency. The World Health Organisation's International Agency for Research on Cancer (IARC) classified microwave radiofrequency electromagnetic fields as Group 2B 'possibly carcinogenic to humans' (May 2011).

The Australian Radiation Protection and Nuclear Safety Agency's (ARPANSA) Fact Sheet 14 How to reduce exposure from mobile phones and other wireless devices *recommends reducing unnecessary exposure* to radiofrequency emissions from mobile and cordless phones, other wireless devices and wireless computer networks (WiFi). As a precautionary approach, Upper Sturt Primary School uses wired computers to safely access the internet. Wired smart boards and telephones have also been installed for educational and administrative purposes.

Operations: To reduce exposure to unnecessary microwave radiofrequency emissions.

Leaders	Teachers	Students	Parents
<p>*Inform staff, parents and students of WiFi and Wireless Devices Policy provide access to wired computers and telephones (no cordless DECT phones)</p> <p>*Ensure new buildings (if internet access required) include a fully wired ethernet infrastructure</p> <p>*Use powerline ethernet adaptors which use existing electrical wiring to extend a network</p> <p>*Recommend mobile phones be switched to flight/ airplane mode when not in use and ipods and tablets be used in flight/airplane mode</p> <p>*Restrict use of microwave oven around children</p>	<p>*Limit use of mobile phone on school grounds and use landline where possible</p> <p>*Turn off mobile phone or switch to flight/ airplane mode when not in use</p> <p>*Keep connected phone away from children</p> <p>*Wireless devices (tablets/ipods) used for teaching must be in flight/airplane mode</p> <p>*Avoid use of microwave oven when children are present</p>	<p>*Turn off mobile phone or switch to flight / airplane mode when not in use</p> <p>*Wireless devices (tablets/ipods) used for learning purposes must be in flight/airplane mode.</p>	<p>*Limit use of mobile phone and wireless devices on school grounds</p> <p>*Turn off mobile phone or switch to flight/airplane mode if spending extended time at school with children eg hearing children read</p> <p>Updated 11/1/ 2014</p>

Parent Teacher Organizations Taking Action

2014 **United Federation of Teachers** (teachers, nurses and professionals working in New York City).

- [New Wireless Radiation Webpage states](#). “Wireless radiation is emitted by the myriad of wireless devices we encounter every day. It was once thought to be relatively harmless. However, we now know that wireless radiation can cause non-thermal biological effects as well, including damage to cells and DNA, even at low levels.
- Resources posted on their site include Dr. Moskowitz’ [Reducing Your Exposure to Wireless Radiation](#) and the BabySafe Project brochure [What You Need to Know About Wireless Radiation and Your Baby](#). “Taking certain precautions around wireless radiation is appropriate for our most vulnerable populations, including pregnant women.”

2014 **New York State Teacher’s Union NYSUT**: A federation of more than 1,200 local unions.

- NYSUT hosted a [Webinar: Risks of wireless technologies and protecting children and staff in schools](#).

2013 [Canadian Teacher Federation’s Brief](#) (200,000 elementary and secondary school teachers)

- “We propose a prudent approach to the use of Wi-Fi, especially where children are present.”
- “We recommend a public education program regarding the relative safety of Wi-Fi exposure”
- “Pedagogical needs could be met in schools with an approach that limits exposure to Wi-Fi.”

2013 [United Teachers of Los Angeles](#), representing 40,000 teachers and staff

- Resolution passed: “I move that UTLA will abide by current National NEA Policy for Environmentally Safe Schools which states that all employees and stakeholders should be informed when there are changes in their exposure to environmental hazards including electromagnetic radiation and that all stakeholders and the public should be notified of any actual and potential hazards.”

2013 [Elementary Teacher’s Federation of Ontario](#) - over 76,000 teachers

- Label the location Of Wi-Fi access points and develop a hazard control program related to wireless.

2012 [The Ontario English Catholic Teachers Association](#) (45,000 Ontario teachers)

- A wired infrastructure recommended as WIFI “may present a potential Health and Safety risk or hazard in the workplace...The safety of this technology has not thoroughly been researched and therefore the precautionary principle and prudent avoidance of exposure should be practiced.”

“The National Education Association believes that all educational facilities must have healthy indoor air quality, be smoke-free, be safe from environmental and chemical hazards, and be safe from hazardous electromagnetic fields.” **Section C-19 of the NEA** [2013-2014 Resolutions](#)

2013 [BC Teachers Federation](#) adopted Wireless Resolutions and Proposed Resolutions

- “The BCTF supports members who are suffering from Electromagnetic Hypersensitivity by ensuring their medical needs are accommodated in the workplace.”
- Proposed Resolutions “the World Health Organization’s classification of radiofrequency/electromagnetic fields emitted by wireless devices as a 2B possible cancer risk to humans; that the BCTF ensures all teachers have the right to work in a safe environment, including the right to work in a Wi-Fi/ wireless-free environment.”
- Recommendation to the Ministry of Education that school boards “begin immediate installation of on/off switches for Wi-Fi routers in schools, thereby reducing microwave radiation exposure.”

2013 [The BC Confederation of Parent Advisory Councils \(BCCPAC\)](#) of 821 Advisory Councils representing over 500,000 parents in British Columbia passed two resolutions.

- Resolution 17 "calls on each Board of Education to have one public school at each education level that is free of Wi-Fi, cordless phones and cell phones. This school will only be equipped with wired computers and wired telephones for personal, educational and administrative purposes."
- Resolution 18 calls on Boards of Education to "cease to install Wi-Fi and other wireless networks in schools where other networking technology is feasible." passed with a clear majority.

2010 [UK VOICE ;The Union for Education Professionals-](#) 20,000 members

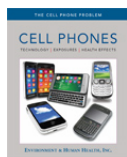
- "Voice has advocated that new Wi-Fi systems should not be installed in schools, that existing systems should be turned off when not required and that schools should consider whether they really need to use Wi-Fi, which was developed to facilitate Internet access on the move rather than to be used as a convenient alternative to cables in dedicated IT facilities."

2010 [Greater Victoria Teachers' Association](#)

- Wi-Fi free zones should be available.
- On/Off routers recommended and record any adverse Wi-Fi health effects.
- Minimal or non-use within elementary schools.

"We will not get rid of the Internet or computers. We should not ignore, however, the enlarging body of science that points to real threats to public health and, especially, our children's safety and well-being. The best approach is precautionary. Reduce the risk by reducing the microwave emissions. It is our obligation as physicians and parents to protect our children. They are the future and our legacy."

Cindy Russell MD, VP Environmental Health of the Santa Clara Medical Association, from her published article "[Shallow Minds](#): How the Internet and WiFi Can Affect Learning."



[THE CELL PHONE REPORT: TECHNOLOGY EXPOSURES, HEALTH EFFECTS, ENVIRONMENT & HUMAN HEALTH, INC., 2012](#)

John Wargo, Ph.D., professor of Environmental Risk and Policy at Yale University and lead author of the report, said, *"The scientific evidence is sufficiently robust showing that cellular devices pose significant health risks to children and pregnant women. The weight of the evidence supports stronger precautionary regulation by the federal government. The cellular industry should take immediate steps to reduce emission of electromagnetic radiation (EMR) from phones and avoid marketing their products to children."*

Recommendations to the Federal Government:

- Set exposure standards to protect human health.
- Evaluate cumulative exposure to radiofrequency radiation in pregnant women and children. Devices that contribute to total exposure include cell phones, cordless DECT (Digital Electronic Cordless Telecommunications) phones, wireless handsets, wireless headsets, wireless routers, Bluetooth devices, wireless alarm systems, etc.

Recommendations to Individuals

- Reduce your exposure to wireless radiation sources.
- Learn about EMF emissions from other wireless devices in your life, including computers, laptops, routers, DECT phones, etc.
- Try to minimize your cumulative exposure to these devices.

INTERNATIONAL PRECAUTIONARY ACTIONS

No medical or scientific organization states low level microwaves are “safe”. Due to the accumulating research showing biological impacts from wireless radiation, governments around the world are taking action to minimize exposure.

“The IARC 2B classification implies an assurance of safety that cannot be offered—a particular concern, given the prospect that most of the world’s population will have lifelong exposure to radiofrequency electromagnetic fields.” - Dr. Jonathan Samet, physician and epidemiologist, Chair of the World Health Organization’s EMF Working Group who made the Class 2 B classification, in a 2014 [Commentary](#).

France: New Legislation and the National Agency for Health, Food and Environmental Safety (ANSES).

- [2015 Law](#) passed: WiFi banned from nursery schools, Wifi must be turned off in elementary schools when not in use, Cellphone advertisements must recommend headsets to reduce exposure to brain.
- [2011 French Cell Phone Statute](#): Merchants must display SAR Radiation levels for different phone models, **all phones must be sold with a headset**, cell phone ads aimed at children younger than 14 are banned and phones made for children under 6 are banned.
- [2013 ANSES Report](#) recommends hands free phones, SAR labeling, and “limiting the population’s exposure to radiofrequencies... especially for children and intensive users, and controlling the overall exposure that results from relay antennas.” [The French National Library](#) along with other libraries in Paris, and a number of universities have removed all Wi-Fi networks. [Herouville-Saint-Clair](#) has removed all Wi-Fi equipment installed in municipalities.

Belgium: [Federal Public Health Regulations](#) on March 2013 due to Health Concerns for Children.

- **Phones designed for children under 7 years old are prohibited from sale.**
- **Total Advertising Ban on cell phones aimed at children younger than 14.**
- Mandatory Radiation SAR levels must be available for consumers at point of sale.
- Warning label on phones: **“Think about your health – use your mobile phone moderately, make your calls wearing an earpiece and choose a set with a lower SAR value.”**
- Recommendations include use of hands-free methods to keep the phone away from the body such as text messaging and not making calls when the signal is weak, such as in an elevator or vehicle.

Spain: [The Parliament of Navarra voted to urge removal of WIFI in schools](#) and to apply the precautionary principle in relation to exposure limits to electromagnetic fields whose boundaries have become “obsolete”.

Australia: In 2013 the Australian Radiation Protection and Nuclear Safety Agency issued [Fact Sheet 14](#): titled *How to Reduce exposure from mobile phones and other wireless devices*.

- Reduce the risk from WiFi devices by “keeping them at a distance, for example placing the wireless router away from where people spend time”, and “reducing the amount of time you use them”.
- “ARPANSA recommends that parents encourage their children to limit their exposure.”

Italy: The [Italian Supreme Court](#) ruled a man’s brain tumor was caused by his cell phone use in 2012.

Finland: The Radiation and Nuclear Safety Authority issued [recommendations](#) for children which include: favoring text messages, parents limiting duration and amount of calls, the use of hands free devices, avoiding calls in a low reception area and keeping the phone away from the body.

Israel: [The Israeli Ministry Of Education](#) has issued guidelines limiting WiFi and [cell phone](#) use in schools.

- Israel’s Minister of Health Rabi Litzman [stated](#) that he supports a ban on Wi-Fi in schools.

Switzerland: [The Governing Council of Thurgau Canton](#) “recommends for schools to forgo the use of wireless networks when the structural makeup of a given school building allows for a wired network.”

European Environment Agency: “All reasonable measures to be taken to reduce exposures to electromagnetic fields, especially radiofrequencies from mobile phones and particularly the exposures to children and young adults. Current exposure limits to be reconsidered.”

Germany: [The German Federal Ministry](#) for Radiation Protection states, "supplementary precautionary measures such as wired cable alternatives are to be preferred to the WLAN system."

- [Bavaria:](#) The State Ministry of Education and Cultural Affairs: "For precautionary reasons the Federal Office for Radiation Protection recommends for schools that if a wireless network is used to place its components in suitable locations and to prefer the use of wired network solutions whenever possible." In 2007 Parliament recommendation to all schools to *not* install wireless LAN networks.
- [Frankfurt:](#) "In Frankfurt's schools there will be no wireless networks in the short or mid term. The Local Education Authority did not wish to conduct a "large scale human experiment," said Michael Damian, spokesperson of the Head of the School Department Jutta Ebeling.

Austria: "The official advice of the [Public Health Department of the Salzburg Region](#) is not to use WLAN and DECT in Schools or Kindergartens." -Gerd Oberfeld, MD. The Austrian Medical Society [cell phone guidelines](#)

United Kingdom: The UK National Health Service [Recommends](#) children keep calls short as "children are thought to be at higher risk of health implications". For the public they have "recommendations to help lower any potential long-term risks".

India: 2012 The Ministry of Communications and Information Technology issued [EMF guidelines](#) with new Exposure Limits lowered to 1/10 of the ICNIRP level, SAR labeling on phones. Government [webpage](#) entitled "A Journey for EMF" details the issue. [Official](#) Recommendations: Headsets, Speakerphones, limiting cell use, increasing distance from devices, and choosing landlines.

- 2013: [Supreme Court of India](#) upholds a decision of the High Court of the State of Rajasthan to remove all cell towers from the vicinity of schools, colleges, hospitals and playgrounds because of radiation "hazardous to life."

Russia: [The Russian National Committee on Non-Ionizing Radiation Protection](#) has repeatedly [warned](#) about electromagnetic radiation impacts on children and recommended WiFi not be used in schools.

- "Thus, for the first time in the human history, children using mobile telecommunications along with the adult population are included into the health risk group due to the RF EMF exposure."
- [Decision of Russian National Committee on Non-Ionizing Radiation Protection](#) 2008, "Children and Mobile Phones: The Health of the Following Generations is in Danger"

Canada: Health Canada offers "[Practical Advice](#)" on reducing exposure to wireless radiation.

- Recommendations: 1. Limit the length of cell phone calls, 2. Replace cell phone calls with text, use "hands-free" devices and 3. Encourage children under the age of 18 to limit their cell phone usage
- 2015: [National Bill C-648 Introduced into the House Of Commons](#), "An Act Respecting the Prevention of Potential Health Risks From Radiofrequency Electromagnetic Radiation" would require manufacturers of all wireless devices to place specific health warning labels clearly on packaging, or face daily penalties /fines and/or imprisonment.

•

**[Resolution 1815:](#) In 2011 The Parliamentary Assembly of the Council of Europe issued
*The Potential Dangers of Electromagnetic Fields and Their Effect on the Environment.***

A call to European governments to "take all reasonable measures" to reduce exposure to electromagnetic fields "particularly the exposure to children and young people who seem to be most at risk from head tumours." The Resolution calls for member states to:

- Implement "information campaigns about the risk of biological effects on the environment and human health, especially targeting children and young people of reproductive age. "
- "Reconsider the scientific basis for the present standards on exposure to electromagnetic fields set by the International Commission on Non-Ionising Radiation Protection, which have serious limitations, and apply ALARA principles, covering both thermal effects and the athermic or biological effects of electromagnetic emissions or radiation."

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

United States: Legislation has been introduced at the state and national level. Some Communities have issued proclamations, resolutions and started initiatives to inform the public of wireless health issues.

- **2014 California, Berkeley:** [11/18/2014 The Berkeley City Council adopted a referral to the City Manager](#) asking the City Manager to draft a cell phone “right to know” ordinance. Once this ordinance is enacted, Berkeley will become the first city in the nation to require cell phone retailers to provide those who purchase a new phone an informational fact sheet which informs buyers to read the user manual to learn the cell phone’s minimum separation distance from the body.
- **2014 New York:** [Wireless Router Labeling in all Suffolk Public buildings](#): 12/2014 The Suffolk County Legislature passed legislation to require all county buildings to post notices that wireless routers are in use such as, "Notice: Wireless technology in use." The resolution, sponsored by Legis. William Spencer (a physician), warns that every wireless device emits radio frequency radiation or microwave radiation. It notes that studies "that have looked at the effects of low-level RFR radiation on human cells and DNA have been inconclusive."
- **2014 Maryland, Greenbelt:** [The Greenbelt Maryland City Council voted unanimously on November 24, 2014](#) to alert citizens about the fine print warnings and possible health risks of cell phones and wireless devices, to send the FCC Chairman a letter urging the adoption of “radiation standards that will protect human health and safety.” They also voted to oppose cell towers on school grounds.
- **2012 Wyoming: Jackson Hole issued a** [Proclamation of Cell Phone Safety](#) which cites concern over long term health effects as well as the increased risk the radiation poses to children.
- **2012 Florida: Pembroke Pines, passed Resolution 3362** expressing the City's "Urgent Concerns" about Wireless Radiation and Health and which encourages citizens to read their manuals and presents information on how to reduce exposure by using a headset or speakerphone. Jimmy Gonzalez, an attorney who had developed brain cancer after heavy cell use, initially petitioned the Commission. [Watch the Video of his powerful testimony here.](#)
- **2010 California, San Francisco:** [Cell Phone Radiation \(How to Reduce Exposures\)](#) Webpage launched.
- **2010 California: Burlingame California City Council** voted to include cell phone safety [guidelines](#) in their Healthy Living in Burlingame initiative (WHO classification and consumer precautions).
- **2010 Maine, Portland** :Mayor Mavodenes, Jr. declared October “Cell Phone Awareness Month”

Proposed Legislation

- **2014,** [City of Berkeley California](#) City Manager and Community Health Commission initiates action for [warning stickers](#) on cell phone boxes.
- **2012** [The Cell Phone Right to Know Act H.R. 6358](#) was introduced receiving strong support from many organizations including the American Academy of Pediatrics. (AAP Letter [here](#).) This legislation called for labels on mobile devices at point of sale, a comprehensive national research program to study whether exposure to wireless devices causes adverse biological effects directed by NIEHS and the EPA and exposure level regulation.
- **2014** [The Maine LD 1013 "The Wireless Information Act"](#) passed the State Senate and House but then failed to pass the second vote. The Bill requires manufacturer's information on radio-frequency exposure be visible on the outside of the cell phone's product packaging.
- **2014** [Hawaii Senate Bill SB 2571](#) was introduced calling for a warning label encouraging consumers to follow the enclosed product safety guidelines to reduce exposure to radiation that may be hazardous to their health.
- **The** [San Francisco Cell Phone Right to Know Ordinance](#) was signed in 2011 requiring cell phone retailers to distribute an educational sheet created by the San Francisco Department of Environment

that explains radiofrequency emissions from cell phones and how consumers can minimize their exposure. The CTIA sued the city and settled with the City to block implementation of the Ordinance in exchange for a waiver of attorneys' fees. The City [Cell Phone Radiation Webpage](#) remains online.

- [SB 932](#) California, [HM 32](#), New Mexico, [HB 1408](#) Pennsylvania, and [SB 679](#) Oregon.

The Fine Print Manufacturer Warnings

All manufacturers of wireless devices have warnings which describe the minimum distance devices must be kept away from users in order to not exceed the as-tested limits for exposure to wireless radiation. For example, the FCC sets exposure limits for laptops and tablets that are tested 20 cm away from the body.

Blackberry Bold 9930: "Keep the BlackBerry device at least 0.59 in. (15 mm) from your body (including the abdomen of pregnant women and the lower abdomen of teenagers) when the BlackBerry device is turned on and connected to the wireless network."

iPads: "to be sure that human exposure to RF energy does not exceed the FCC, IC, and European Union guidelines, always follow these instructions and precautions: Orient the device in portrait mode with the Home button at the bottom of the display, or in landscape mode with the cellular antenna away from your body or other objects."

Samsung 3G Laptop: "Usage precautions during 3G connection : Keep safe distance from pregnant women's stomach or from lower stomach of teenagers. Body worn operation: Important safety information regarding radiofrequency radiation (RF) exposure. To ensure compliance with RF exposure guidelines the Notebook PC must be used with a minimum of 20.8 cm antenna separation from the body."

X Box 360 Gaming Console: To comply with IC RF exposure compliance requirements, the antenna used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

iPhone 4: "To be sure that human exposure does not exceed the FCC guidelines, always follow these instructions... keep iPhone at least 15 mm (5/8 inch) away from the body, and only use carrying cases, belt clips, or holders that do not have metal parts and that maintain at least 15 mm (5/8) inch separation between the iPhone and the body." To view the information on your iPhone go to Settings > General > About > Legal > RF Exposure.

Belkin WIFI Router Manual: "Caution: Exposure to Radiofrequency Radiation: The device shall be used in such a manner that the potential for human contact normal operation is minimized. This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator and your body."

HP Printer: "In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 20 cm (8 inches) during normal operation."

Baby Monitor Motorola MBP33: The Baby unit shall be installed and used such that parts of the user's body other than the hands are maintained at a distance of approximately 20 cm (8 inches) or more.

Federal Regulations and Mobile Devices

"...Mobile devices are transmitters designed to be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons." [FCC, BULLETIN 65, 1997](#)

Why are these Fine Print Warnings important?

If these distances are not maintained, people can be exposed to radiation at levels that exceed the current FCC standard, potentially exposing them to *thermal (heating)* exposures. The SAR for laptops, printers, routers and tablets should be less than 1.6 W/kg for any 1 gram of tissue, as measured 20 cm (~8 inches) from the device. Because of the inverse square law if devices are used closer than 8 inches to the body, exposures grow exponentially. Thus, at 5 inches it could increase 16-fold, and at less than one inch (*i.e. on your lap*) it could increase **100-fold**.

Most people, especially children and young adults, carry and use their wireless devices directly against their bodies. Consumers do not know that using a laptop on your lap, clutching an iPad to your chest or tucking a cell phone in your pocket or bra is potentially unsafe and could result in the user getting radiation exposures that exceed the standard. Since warnings are deep in the legal fine print of manuals and on manufacturer websites, they are often overlooked.

What Can Schools Do?

Staff and students and parents need to be informed of this information concerning federal regulations. This information can be incorporated into the Student Handbook and detailed in the Bring Your Own Device Policies that many schools are developing. Schools can teach students and staff ways to minimize exposures and develop policies that minimize radiation exposures from the devices students bring in.

Important Note: Furthermore, compliance with current guidelines does not necessarily mean that children and pregnant women are protected from thermal effects as their absorption rates were not considered during the development of standards. Research is raising serious safety issues concerning these current guidelines.

Current FCC Exposure Guidelines Were Not Set To Protect Children

1. Current testing procedures do not consider smaller size of children and teen brains.
2. Current exposure standards were set to protect against heating injury only. They do not protect against other mechanisms of action nor against chronic low level exposures.

"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 (ICNRP), are thermally based, and do not apply to chronic, non-thermal exposure situations. They are believed to protect against injury that may be caused by acute exposures that result in tissue heating or electric shock and burn..." [Norbert Hankin](#) of the EPA 2002



"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." - **The U.S. Department of Interior** in a [2014 Letter](#).

Answers to Commonly Asked Questions Children and Wireless Radiation

Q: Hasn't our government set safety standards based on a scientific review of the evidence?

A: The EPA, the CDC nor the FDA have never done a comprehensive scientific review of this radiation to set standards that protect human health. Current exposure standards were developed in 1993 when wireless technology was not widespread as it is today. Currently, the FCC is the agency that ensures compliance with radiofrequency exposure standards in this country. However, the FCC is not a medical nor science agency. Current standards have not been reviewed for over 18 years in the United States. EHT and many other experts in the field are calling the current standards outdated and inadequate to protect human health.

The CDC is not charged with monitoring this issue either. In fact they were recently briefed on the issue.

Please see "Mobile Phone Use and Cancer Risk: Research on a Group 2B Carcinogen" Joel Moskowitz, Webinar for CDC Workgroup on Cancer Prevention (Oct 29, 2014)

Slides: <http://bit.ly/CDCWebinar102914>

Audio: <http://bit.ly/101l2lR> or <http://bit.ly/1tDZbg2>

Q: I heard that the overwhelming majority of studies that have been published in scientific journals around the world show that wireless microwave radiation is *not* a health risk. Please explain this.

A: Actually the human evidence for risk has increased. Since 2011, several [major epidemiologic studies](#) provide further evidence that long-term mobile phone use is associated with increased risk of glioma (a type of malignant brain tumor) and acoustic neuroma (a nonmalignant tumor of the nerve that connects the ear to the brain).

Q: Are scientists and medical organizations concerned about how the inadequate standards might impact public health?

A: Yes. The American Academy of Pediatrics has called on the FCC to "Protect children's health and wellbeing," stating that "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."

When it comes to safety considerations, using cords or cables for ethernet connectivity with Wi-Fi features turned off and materials already downloaded to the device. This eliminates the risk from this microwave exposure.

Q: Is the Wi-Fi technology being used in schools the same as what is being used in most homes today?

A: No. Wi-Fi systems in school districts are usually much higher strength because they are designed to operate hundreds of computers simultaneously, unlike home based consumer systems that only operate a handful of computers.

Q: Wireless is everywhere. Are there really actions that will make a difference?

A: Children spend most of their time at home sleeping and at school learning. By making simple changes such as using cords and cables for computers and keeping devices on Airplane mode, a child's daily exposure will be significantly reduced. Since exposure is cumulative and children will have a lifetime to be exposed, such reduction actions will make a tremendous difference.

Q: Wi-Fi router radiation levels are so low. How is this any different than the electromagnetic radiation that has been around since the Earth began?

A: Our society has never before been exposed to the current levels of microwave radiation in our workplaces, homes and schools today. Wi-Fi emits levels of radiofrequency microwave radiation millions of times higher than what our parents and grandparents ever experienced. Wireless routers in classrooms are like bringing mini cell towers into classrooms. They connect to each device in the room as a cell tower connects to each phone. Routers also are constantly putting out radiation as they check in with all the devices in the room.

The Environmental Health Trust supports the appropriate use of technology in classrooms and applauds the creative use of digital resources. The use of technology and access to the internet does not require the constant exposure of children to microwave radiation. Cords and cables as wireline (non-wireless) connections are the safest option for internet access.

Bibliography

(1997). [Evaluating Compliance with FCC, Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields](#), *Federal Communications Commission*. 97-01.

(2011). [WHO/ IARC classifies radiofrequency electromagnetic fields as possibly carcinogenic to humans](#). *World Health Organization*.

2013, [A Radiofrequency Toolkit for Environmental Health Practitioners](#). *BC CDC*. 1-371.

Aldad T, Gan G, Gao X, Taylor H.(2012). [Fetal Radiofrequency Radiation Exposure From 800-1900 Mhz-Rated Cellular Telephones Affects Neurodevelopment and Behavior in Mice](#). *Scientific Reports*. 2, 3-12.

Arnetz B, Akerstedt T, Hillet L, Lowden A, Kuster N, Wiholm C .(2007). [The Effects of 884 MHz GSM Wireless Communication Signals on Self-reported Symptom and Sleep \(EEG\)- An Experimental Provocation Study](#) *PIERS Online*. 3(7), 1148-1150.

Baan R. (2012). [Monograph 102 on RF-EMF](#). The IARC Monographs. 102.

Byun Y-H, Ha M, Kwon H-J, Hong Y-C, Leem J-H. (2013). [Mobile Phone Use, Blood Lead Levels, and Attention Deficit Hyperactivity Symptoms in Children: A Longitudinal Study](#). *PLoS ONE*. 8(3)

Gandhi OP, Morgan LL, De Salles AA, Han YY, Herberman RB, Davis DL. (2012). [Exposure limits: the underestimation of absorbed cell phone radiation, especially in children](#). *Electromagn Biol Med*. 31(1), 3451.

Gultekin D, Moeller L. (2012). [NMR imaging of cell phone radiation absorption in brain tissue](#). *National Academy of Sciences*. 110(1), 58–63.

Hankin N. (2002). [Reply to Janet Newton's letter: Environmental Protection Agency](#). *Center for Science and Risk Assessment Radiation Protection Unit*.

Morgan L, Kesari S, Davis D. (2014). [Why children absorb more microwave radiation than adults: The consequences](#). *Journal of Microscopy and Ultrastructure*. 2(2).

Peart K (2012). . ["Cell phone use in pregnancy may cause behavioral disorders in offspring"](#). *Yale News*.

Roda C, Perry S. (2014). [Mobile phone infrastructure regulation in Europe: Scientific challenges and human rights protection](#). *Environmental Science & Policy*. 37, 204-214.

Russell C. (2013). [Shallow Minds: How the Internet and Wi-Fi in Schools Can Affect Learning](#). Santa Clara County Medical Association.

Samet J, Straif K, Schuz J, Saracci R. (2014). [Commentary: mobile phones and cancer: next steps after the 2011 IARC review](#). *Epidemiology*. 25(1), 23-7.

Taylor W. (2014). [Letter to Mr. Eli Veenendaal of the National Telecommunications and Information Administration](#). *US Department of Commerce*.

