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**Wireless Perils: Why We Should be Worried About Chronic Exposure of Children to Wireless Technologies.**

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Massively increased RF exposure has no precedent in human history. These exposures simply did not exist 100 years ago. Our use of microwave frequencies for wireless communication means that we have no track record for the consequences, but there is substantial and worrisome evidence of health risks, particularly for children. The number of brain tumor cases in the US and Europe has increased up to 40% in the past twenty years, and is increasing in ALL age groups. Males between 20 and 40 years old are the most affected, particularly white-collar workers and professionals. Researchers point to environmental causes that cannot be ruled out – including cellular phones, computers and other exposure to electromagnetic radiation.

Parents and their children need to understand more about the possible risks of using cell and cordless phones in the home and at wireless computers at school. A growing body of scientific evidence suggests that chronic, low-level exposure to radiofrequency (RF) from cell phones, cordless phones, mobile phone masts and wireless connections to the internet may be harmful, particularly to children.

Children today can be exposed by:

- Cell phone use (by the child, and to second-hand radiation from others)
- The family's cordless phones in the home
- Wireless LAN (or Land-area Network) systems at schools or home
- Cell towers in the neighborhood, or near schools
- Wireless computers at home and at school
- Two-way radios (think family ski-trips)
- WIFI systems (at local stores and clubs, for wireless computers)
- Remote control toys (wireless)



**The BioInitiative Report on children and radiofrequency radiation exposure from wireless technologies (cell phones, cordless phones, wireless technologies) says the following:**

[www.bioinitiative.org](http://www.bioinitiative.org), Section 17.

*“Public exposure to electromagnetic radiation (power-line frequencies, radiofrequency and microwave) is growing exponentially worldwide. There is a rapid increase in electrification in developing countries, even in rural areas. Most members of society now have and use cordless phones, cellular phones, and pagers. In addition, most populations are also exposed to antennas in communities designed to transmit wireless RF signals. Some developing countries have even given up running land lines because of expense and the easy access to cell phones. Long-term and cumulative exposure to such massively increased RF has no precedent in human history. Furthermore, the most pronounced change is for children, who now routinely spend hours each day on the cell phone. Everyone is exposed to a greater or lesser extent. No one can avoid exposure, since even if they live on a mountain-top without electricity there will likely be exposure to communication-frequency RF exposure. Vulnerable populations (pregnant women, very young children, elderly persons, the poor) are exposed to the same degree as the general population. Therefore it is imperative to consider ways in which to evaluate risk and reduce exposure. Good public health policy requires preventative action proportionate to the potential risk of harm and the public health consequence of taking no action. “*

*“The exposure of children to EMF has not been studied extensively; in fact, the FCC standards for exposure to radiofrequency radiation are based on the height, weight and stature of a 6-foot tall man, not scaled to children or adults of smaller stature. They do not take into account the unique susceptibility of growing children to exposures (SCENIHR, 2007; Jarosinska and Gee, 2007), nor are there studies of particular relevance to children.*

*“Children are largely unable to remove themselves from exposures to harmful substances in their environments. Their exposure is involuntary.”*

*“Laboratory studies show that the nervous system of both humans and animals is sensitive to ELF and RF. Measurable changes in brain function and behavior occur at levels associated with new technologies including cell phone use. Exposing humans to cell phone radiation can change brainwave activity at levels as low as 0.1 watt per kilogram SAR (W/Kg)\*\*\* in comparison to the US allowable level of 1.6 W/Kg and the International Commission for Non-ionizing Radiation Protection (ICNIRP) allowable*



*level of 2.0 W/Kg. It can affect memory and learning. It can affect normal brainwave activity. ELF and RF exposures at low levels are able to change behavior in animals.”*

**There is little doubt that electromagnetic fields emitted by cell phones and cell phone use affect electrical activity of the brain.**

*“Effects on brain function seem to depend in some cases on the mental load of the subject during exposure (the brain is less able to do two jobs well simultaneously when the same part of the brain is involved in both tasks). Some studies show that cell phone exposure speeds up the brain’s activity level; but also that the efficiency and judgment of the brain are diminished at the same time. One study reported that teenage drivers had slowed responses when driving and exposed to cell phone radiation, comparable to response times of elderly people. Faster thinking does not necessarily mean better quality thinking.”*

**Changes in the way in which the brain and nervous system react depend very much on the specific exposures. Most studies only look at short-term effects, so the long-term consequences of exposures are not known.**

*“Factors that determine effects can depend on head shape and size, the location, size and shape of internal brain structures, thinness of the head and face, hydration of tissues, thickness of various tissues, dielectric constant of the tissues and so on. Age of the individual and state of health also appear to be important variables. Exposure conditions also greatly influence the outcome of studies, and can have opposite results depending on the conditions of exposure including frequency, waveform, orientation of exposure, duration of exposure, number of exposures, any pulse modulation of the signal, and when effects are measured (some responses to RF are delayed). There is large variability in the results of ELF and RF testing, which would be expected based on the large variability of factors that can influence test results. However, it is clearly demonstrated that under some conditions of exposure, the brain and nervous system functions of humans are altered. The consequence of long-term or prolonged exposures have not been thoroughly studied in either adults or in children.”*

**The consequence of prolonged exposures to children, whose nervous systems continue to develop until late adolescence, is unknown at this time. This could have serious implications to adult health and functioning in society if years of exposure of the young to both ELF and RF result in diminished capacity for thinking, judgment, memory, learning, and control over behavior.**

*People who are chronically exposed to low-level wireless antenna emissions report symptoms such as problems in sleeping (insomnia), fatigue, headache, dizziness, grogginess, lack of concentration, memory problems, ringing in the ears (tinnitus), problems with balance and orientation, and difficulty in multi-tasking. In children, exposures to cell phone radiation have resulted in changes in brain oscillatory activity during some memory tasks. Although scientific studies as yet have not been able to confirm a cause-and-effect relationship; these complaints are widespread and the cause of significant public concern in some countries where wireless technologies are fairly mature and widely distributed (Sweden, Denmark, France, Germany, Italy, Switzerland, Austria, Greece, Israel). For example, the roll-out of the new 3<sup>rd</sup> Generation wireless phones (and related community-wide antenna RF emissions in the Netherlands) caused almost immediate public complaints of illness.(5) [www.bioinitiative.org](http://www.bioinitiative.org), Section 1.*

*Like second-hand smoke, EMF is a complex mixture, where different frequencies, intensities, durations of exposure(s), modulation, waveform and other factors is known to produce variable effects. Many years of scientific study has produced substantial evidence that EMF may be considered to be both carcinogenic and neurotoxic. The weight of evidence is discussed in this report, including epidemiological evidence and studies on laboratory animals”*

*“A cautionary target level for pulsed RF exposures for ambient wireless that could be applied to RF sources from cell tower antennas, WI-FI, WI-MAX and other similar sources is proposed. The recommended cautionary target level is 0.1 microwatts per centimeter squared ( $\mu\text{W}/\text{cm}^2$ )\*\* (or 0.614 Volts per meter or  $\text{V}/\text{m}$ )\*\* for pulsed RF where these exposures affect the general public; this advisory is proportionate to the evidence and in accord with prudent public health policy. A precautionary limit of 0.1  $\mu\text{W}/\text{cm}^2$  should be adopted for outdoor, cumulative RF exposure. This reflects the current RF science and prudent public health response that would reasonably be set for pulsed RF (ambient) exposures where people live, work and go to school. This level of RF is experienced as whole-body exposure, and can be a chronic exposure where there is wireless coverage present for voice and data transmission for cell phones, pagers and PDAs and other sources of radiofrequency radiation. An outdoor precautionary limit of 0.1  $\mu\text{W}/\text{cm}^2$  would mean an even lower exposure level inside buildings, perhaps as low as 0.01  $\mu\text{W}/\text{cm}^2$ . Some studies and many anecdotal reports on ill health have been reported at lower levels than this; however, for the present time, it could prevent some of the most disproportionate burdens placed on the public nearest to such installations. Although this RF target level does not preclude further rollout of WI-FI technologies, we also recommend that wired alternatives to WI-FI be implemented, particularly in schools and libraries so that children are not subjected to elevated RF levels until more is understood about possible health impacts. This recommendation should be seen as an interim precautionary limit that is intended to guide preventative actions; and more conservative limits may be needed in the future.” [www.bioinitiative.org](http://www.bioinitiative.org), Section 17.*



**Why don't we hear more about this issue? What about existing standards that are supposed to protect the public?**

Most international agencies regulate RF based on concern for thermal injury (burning or heating of tissue). For example, for the 800-900 MHz range (cell phones) the standard is about 580 microwatts/cm<sup>2</sup> (for 862 MHz). There are dozens of studies showing that the human body (and other mammals) can detect and react to the "signal" at levels more than a thousand times lower. The range of concern for health effects is 0.01 to 1 or 5 microwatts/cm<sup>2</sup>..... far below the limits based on thermal standards. There are no non-thermal standards that address exposures that do affect us by signaling or the 'information content' of the RF exposure.

So, these exposures are increasing in our schools and neighborhoods with levels now exceeding those thresholds where people report being affected. Radiofrequency radiation may produce changes in brain function that have implications for cognitive function and attention, memory loss, altered white blood cell activity, fatigue, confusion, spatial disorientation, slowed motor skills, and delayed school advancement in children... as well as a constellation of other reported effects.

**Who is looking at this issue? What are they saying?**

The UK Health Protection Agency advises children to limit their use of mobiles. The UK Government's advisor Prof. Lawrie Challis who heads the committee on mobile phone safety research called for limits on WI-FI use (wireless computer use) for children, citing that health problems are likely to be more serious in children. Children who use Wi-Fi enabled laptops should only do so if they are kept a safe distance (however, no safe distance is known). Using a wireless laptop in the lap is comparable to the RF from a mobile phone, because the antenna is contained within the computer against the lap.

The British Medical Association Board of Science and Education recommends limits on children's cell phone use, and the accompanying leaflet from the Department of Health recommends children under 16 not use mobile phones at all. Other countries that have either adopted or recommended bans or limitations on cell phone use for children include Russia, Italy and Germany. In addition, Russia advises against their use by women who are pregnant.

The German Government [Bundesregierung] recommended in 2007 that "the use of WLAN in the workplace or at home should be avoided, if possible. In order to reduce personal radiation exposure, it is better to remain with conventional cable-connected networks."



The French government released a warning in January 2008 concerning mobile phone health effects, particularly on children. The government is not acknowledging a link between mobile phone use and cancer but recommends reducing exposures given the evidence (precaution principle). Some schools and libraries in Paris announced the removal of wireless WLAN systems in late 2007 due to health complaints from their staff workers.

The Austrian Medical Association is pressing for a ban on wi-fi in schools. Dr Gerd Oberfeld, Salzburg's head of environmental health and medicine, has describes WI-FI as "dangerous" to sensitive people.

The World Health Organization Report on Children and Health (2002) indicates that prudent avoidance for children would restrict any new exposures to radiofrequency radiation. The WHO expects to have the result of its five-year study on radiofrequency radiation completed by 2005 or 2006. Until that time, there are serious questions about potential health effects, particularly to children.

The US National Institutes of Health - National Toxicology Program is now studying RF as a potential carcinogen because of concerns based on the existing but incomplete scientific evidence (the NTP program performs studies on chemicals and other things in the environment to see whether they are cancer-causing).

The Los Angeles Unified School District has adopted a policy that prohibits cell sites on LAUSD property, and requires that new schools avoid siting near an existing cell site.

We need to understand more about the potential risks of exposures, and what sources need to be assessed BEFORE we allow the proliferation of RF sources at school.

Experts recommend that children not use cell or cordless phones, except in emergencies. Kids should use a corded phone instead. Further, children should not be exposed to the second-hand radiation from anyone else's cell phone. A four to five-foot radius is required for most cell phones. Schools should avoid installing wireless LAN computer systems and other wireless computer hookups.

An international working group of scientists, researchers and public health policy professionals (The BioInitiative Working Group) released its report August 31, 2007 on electromagnetic fields (EMF) and health. It raises serious concern about the safety of existing public limits that regulate how much EMF is allowable from power lines, cell phones, cordless phones and many other sources of exposure in daily life. The report from ([www.bioinitiative.org](http://www.bioinitiative.org)) documents the scientific evidence that power line EMF exposure is responsible for hundreds of new cases of childhood leukemia every year in the United



States and around the world. It also documents brain tumor risks and other health risks from exposure to wireless technologies, including cell and cordless phones. Risks to children are discussed, since children are usually more sensitive to environmental toxins

The report provides detailed scientific information on health impacts when people are exposed to electromagnetic radiation hundreds or even thousands of times below limits currently established by the Federal Communications Commission (US FCC) and International Commission for Non-Ionizing Radiation Protection in Europe (ICNIRP). The authors reviewed more than 2000 scientific studies and reviews, and concluded that the existing public safety limits are inadequate to protect public health. From a public health policy standpoint, new public safety limits, and limits on further deployment of risky technologies are warranted based on the total weigh of evidence. The Report recommends new public safety limits, in some cases, thousands of times lower than present safety standards to address the evidence that chronic exposure to low-intensity levels of EMF can be harmful to health and well-being. Children should be protected against years of low-level wireless exposures due to health concerns that are now emerging. Since there are good options such as wired cable modem, and traditional corded phones there is no need for wireless in homes and schools.

There is too much scientific information to ignore. The question (as always) is "what is the weight of the evidence and what do we do about it in the interim?", Where our kids are concerned, a little care today may save us heartache and regret tomorrow.

For a complete list of studies, see [www.bioinitiative.org](http://www.bioinitiative.org) and [Radiofrequency and Microwave Exposure](#) in the San Francisco Medicine, March 2001 by Cindy Sage, Sage Associates, published by the San Francisco Medical Society.

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