

Cell Phone Radiation and Health Recommendations

Joel M. Moskowitz, Ph.D., Director
Center for Family and Community Health, School of Public Health
University of California, Berkeley
May 11, 2011

Cell phone radiation is harmful – keep a safe distance between your body and your cell phone.

Although we do not yet have *conclusive* evidence, ample research demonstrates increased health risks, including increased risk of tumors of the brain and salivary gland after 10 years of cell phone use. There is also evidence of short-term health risks, for example, sperm damage.

Based upon our review of the research, our primary recommendation has been to maintain a safe distance between your body and your cell phone whenever it is turned on. You are exposed to 100 times less radiation if you keep your phone ten inches from your body instead of an inch.

Consumers need information about cell phone radiation, its harmful effects and ways to reduce risk. Consumers need to know the Specific Absorption Rate (SAR) and the typical amount of electromagnetic radiation (EMR) that cell phones emit.

Although the SAR is not a perfect measure of exposure, consumers have a right to know a cell phone's SAR, which is a measure of the **maximum** radiation emitted, before they purchase a new phone. In addition, just like the Environmental Protection Agency requires car manufacturers to provide gas mileage ratings for **typical** city and highway driving, the Federal government should also require that cell phone manufacturers provide estimates of **typical** radiation exposure. Your cumulative exposure to cell phone radiation is related to how you use your phone, how much you use it, and your phone's typical EMR output.

Your cell phone carrier may matter more than your cell phone model in terms of your typical EMR exposure.

GSM phones typically emit much more EMR on average than CDMA phones, even phones with the same SAR. GSM also emits pulses which may increase biologic reactivity. If you are concerned about your EMR exposure, you should consider using a carrier that employs CDMA (e.g., Verizon, Sprint) instead of one that employs GSM (e.g., AT&T or T-Mobile). The toxicology research suggests that CDMA may be safer.

The Federal government should lower the SAR legal limit and adopt better measures of EMR exposure.

The current limit that all phones must have a maximum SAR of 1.6 watts/kilogram or less is inadequate and does not protect cell phone users from harm due to cell phone radiation.

The Federal government should adopt precautionary health warnings and harm reduction measures (e.g. include wired headsets with every phone).

Governments must fund independent research on the health effects of exposure to EMR.

We are all exposed to a substantial amount of EMR on a daily basis. Sources include cell phones and cell towers, cordless phones, "dirty electricity," Wi-Fi, Bluetooth, TV and radio transmissions, and Smart Meters. Although some EMR exposure is likely benign, other EMR exposures appear to be harmful, especially over the long term. A \$1 per year fee on cell phones would generate \$300 million annually in the U.S. for research and education regarding EMR health effects.

Selected Resources on Cell Phone Radiation and Health

Government must inform us of cell phone risk

Joel M. Moskowitz, Open Forum, *San Francisco Chronicle*, April 28, 2010

<http://sfgate.com/cgi-bin/article.cgi?f=/c/a/2010/04/28/EDMB1D58TC.DTL>

====

Cell Phones & Brain Tumors: What Does the Science Show?

Joel Moskowitz, Commonwealth Club of California, November 18, 2010

Presentation (15 minute video): <http://vimeo.com/17266112>

Slides: <http://electromagnetichealth.org/wp-content/uploads/2010/11/Moskowitz-Mobile Phone Use Brain Tumor Risk CC 11-18-10 ver 1jr.ppt>

<http://electromagnetichealth.org/electromagnetic-health-blog/cc-video/>

====

Myung SK, Ju W, McDonnell DD, Lee YJ, Kazinets G, Cheng CT, Moskowitz JM. Mobile phone use and risk of tumors: a meta-analysis. *Journal of Clinical Oncology*. 2009 Nov 20; 27(33):5565-5572.

PURPOSE: Case-control studies have reported inconsistent findings regarding the association between mobile phone use and tumor risk. We investigated these associations using a meta-analysis. **METHODS:** We searched MEDLINE (PubMed), EMBASE, and the Cochrane Library in August 2008. Two evaluators independently reviewed and selected articles based on predetermined selection criteria. **RESULTS:** Of 465 articles meeting our initial criteria, 23 case-control studies, which involved 37,916 participants (12,344 patient cases and 25,572 controls), were included in the final analyses. Compared with never or rarely having used a mobile phone, the odds ratio for overall use was 0.98 for malignant and benign tumors (95% CI, 0.89 to 1.07) in a random-effects meta-analysis of all 23 studies. However, a significant positive association (harmful effect) was observed in a random-effects meta-analysis of eight studies using blinding, whereas a significant negative association (protective effect) was observed in a fixed-effects meta-analysis of 15 studies not using blinding. Mobile phone use of 10 years or longer was associated with a risk of tumors in 13 studies reporting this association (odds ratio = 1.18; 95% CI, 1.04 to 1.34). Further, these findings were also observed in the subgroup analyses by methodologic quality of study. Blinding and methodologic quality of study were strongly associated with the research group. **CONCLUSION:** The current study found that there is possible evidence linking mobile phone use to an increased risk of tumors from a meta-analysis of low-biased case-control studies. Prospective cohort studies providing a higher level of evidence are needed.

<http://www.ncbi.nlm.nih.gov/pubmed/19826127>

====

Khurana VG, Teo C, Kundi M, Hardell L, Carlberg M. Cell phones and brain tumors: a review including the long-term epidemiologic data. *Surgical Neurology*. 2009 Sep;72(3):205-14; discussion 214-5.

BACKGROUND: The debate regarding the health effects of low-intensity electromagnetic radiation from sources such as power lines, base stations, and cell phones has recently been reignited. In the present review, the authors attempt to address the following question: is there epidemiologic evidence for an association between long-term cell phone usage and the risk of developing a brain tumor? Included with this meta-analysis of the long-term epidemiologic data are a brief overview of cell phone technology and discussion of laboratory data, biological mechanisms, and brain tumor incidence. **METHODS:** In order to be included in the present meta-analysis, studies were required to have met all of the following criteria: (i) publication in a peer-reviewed journal; (ii) inclusion of participants using cell phones for > or = 10 years (ie, minimum 10-year "latency"); and (iii) incorporation of a "laterality" analysis of long-term users (ie, analysis of the side of the brain tumor relative to the side of the head preferred for cell phone usage). This is a meta-analysis incorporating all 11 long-term epidemiologic studies in this field. **RESULTS:** The results indicate that using a cell phone for > or = 10 years approximately doubles the risk of being diagnosed with a brain tumor on the same ("ipsilateral") side of the head as that preferred for cell phone use. The data achieve statistical significance for glioma and acoustic neuroma but not for meningioma. **CONCLUSION:** The authors conclude that there is adequate epidemiologic evidence to suggest a link between prolonged cell phone usage and the development of an ipsilateral brain tumor.

<http://www.ncbi.nlm.nih.gov/pubmed/19328536>

====

A Kelsh, Mona Shum, Asher R Sheppard, Mark Mcneely, Niels Kuster, Edmund Lau, Ryan Weidling, Tiffani Fordyce, Sven Khn, Christof Sulser. Measured radiofrequency exposure during various mobile-phone use scenarios. *Journal of Exposure Science and Environmental Epidemiology* advance online publication 16 June 2010;doi: 10.1038/jes.2010.12.

Epidemiologic studies of mobile phone users have relied on self reporting or billing records to assess exposure. Herein, we report quantitative measurements of mobile-phone power output as a function of phone technology, environmental terrain, and handset design. Radiofrequency (RF) output data were collected using software-modified phones that recorded power control settings, coupled with a mobile system that recorded and analyzed RF fields measured in a phantom head placed in a vehicle. Data collected from three distinct routes (urban, suburban, and rural) were summarized as averages of peak levels and overall averages of RF power output, and were analyzed using analysis of variance methods. **Technology was the strongest predictor of RF power output. The older analog technology produced the highest RF levels, whereas CDMA had the lowest, with GSM and TDMA showing similar intermediate levels.** We observed generally higher RF power output in rural areas. There was good correlation between average power control settings in the software-modified phones and power measurements in the phantoms. Our findings suggest that phone technology, and to a lesser extent, degree of urbanization, are the two stronger influences on RF power output. Software-modified phones should be useful for improving epidemiologic exposure assessment.

<http://www.ncbi.nlm.nih.gov/pubmed/20551994>

Note: On average the GSM phones in this study emitted 28 times more radiation than the CDMA phones.

====

Jukka Juutilainen, Anne H, Timo Kumlin, Jonne Naarala. Review of possible modulation-dependent biological effects of radiofrequency fields. *Bioelectromagnetics*. Published online Apr 7, 2011.

The biological effects of modulated radiofrequency (RF) electromagnetic fields have been a subject of debate since early publications more than 30 years ago, suggesting that relatively weak amplitude-modulated RF electromagnetic fields have specific biological effects different from the well-known thermal effects of RF energy. This discussion has been recently activated by the increasing human exposure to RF fields from wireless communication systems. Modulation is used in all wireless communication systems to enable the signal to carry information. A previous review in 1998 indicated that experimental evidence for modulation-specific effects of RF energy is weak. This article reviews recent studies (published after 1998) on the biological effects of modulated RF fields. The focus is on studies that have compared the effects of modulated and unmodulated (continuous wave) RF fields, or compared the effects of different kinds of modulations; studies that used only one type of signal are not included. While the majority of recent studies have reported no modulation-specific effects, there are a few interesting exceptions indicating that there may be specific effects from amplitude-modulated RF fields on the human central nervous system. These findings warrant follow-up studies.

<http://www.ncbi.nlm.nih.gov/pubmed/21480304>

===

Behari J. Biological responses of mobile phone frequency exposure. *Indian J Exp Biol.* 2010 Oct;48(10):959-81.

Existence of low level electromagnetic fields in the environment has been known since antiquity and their biological implications are noted for several decades. As such dosimetry of such field parameters and their emissions from various sources of mass utilization has been a subject of constant concern. Recent advancement in mobile communications has also drawn attention to their biological effects. Hand held children and adults alike generally use mobile sources as cordless phones in various positions with respect to the body. Further, an increasing number of mobile communication base stations have led to wide ranging concern about possible health effects of radiofrequency emissions. There are two distinct possibilities by which health could be affected as a result of radio frequency field exposure. These are thermal effects caused by holding mobile phones close to the body and extended conversations over a long period of time. Secondly, there could be possibly non thermal effects from both phones and base stations whereby the affects could also be cumulative. Some people may be adversely affected by the environmental impact of mobile phone base stations situated near their homes, schools or any other place. In addition to mobile phones, appliances like microwave oven etc are also in increasing use. Apart from the controversy over the possible health effects due to the non-thermal effect of electromagnetic fields the electromagnetic interaction of portable radio waves with human head needs to be quantitatively evaluated. Relating to this is the criteria of safe exposure to the population at large. While a lot of efforts have gone into resolving the issue, a clear picture has yet to emerge. Recent advances and the problems relating to the safety criteria are discussed.

<http://www.ncbi.nlm.nih.gov/pubmed/21299039>