UNIVERSITY AT ALBANY
State University of New York

Institute for Health and the Environment
WHO Collaborating Center in Environmental Health

STATEMENT IN SUPPORT OF
"AN ACT TO CREATE THE CHILDREN'S WIRELSS PROTECTION ACT"

David O. Carpenter, MD
Institute for Health and the Environment
University at Albany
Rensselaer, NY 12144
2 May 2013

Credentials and Experience:

My name is David O. Carpenter. I am a public health physician who currently holds the positions of Director, Institute for Health and the Environment at the University at Albany and Professor of Environmental Health Sciences in the School of Public Health. After graduating from Harvard College and Harvard Medical School I chose a career of research and public health, rather than the practice of patient medicine. I spent seven years doing basic neuroscience research at the National Institute of Mental Health in Bethesda, MD, and then accepted a position that I held for eight years as a department head in the Armed Forces Radiobiology Research Institute, also in Bethesda. This Institute is one of the primary Department of Defense research institutes dealing with the health effects of both ionizing and non-ionizing radiation. The radiofrequency fields used by cell phones are one form of non-ionizing radiation.

Two of the major public health issues in New York in the late 1970s were Love Canal and Three Mile Island. Because of my experience with neurotoxicology (relevant to Love Canal) and radiation biology (relevant to Three Mile Island and electromagnetic fields), I was recruited to become the Director of the Wadsworth Center for Laboratories and Research of the New York State Department of Health in 1980. The Wadsworth Laboratories are the third largest public health laboratories in the United States, with about 1,000 employees at that time. Two weeks before I arrived in Albany there was a settlement between the New York Power Authority and the New York Public Service Commission requiring that the New York State Department of Health administer a research program to determine whether there were health effects from exposure to electromagnetic fields coming from powerlines, and I was given the responsibility for administration of this program. With the five million dollars assessed from New York utilities we supported 16 research projects, issuing a final report in 1987. That report concluded that elevated exposure to magnetic fields from powerlines was associated with an increase in the risk of childhood leukemia. After that time I became the spokesperson for the State of New York on issues related to electromagnetic fields until I left employment with the Department of Health in 1998. I have been involved in the issue of health hazards from exposure to electromagnetic fields of all frequencies since that time. I have edited a two volume book on the subject, published in 1994. I served as the co-editor of the Bioinitiative Report (www.bioinitiative.org), a comprehensive review of the literature on this subject. I testified at hearings on electromagnetic fields before the US House of Representatives in the late 1990s and again in 2008, and at the President's Cancer Panel in 2009. I have also provided testimony on the human health effects of electromagnetic fields for the states of Connecticut, California, Vermont and Maine.

During my tenure as the Director of the Wadsworth Laboratories I promoted a collaborative relationship between the Department of Health and the University at Albany, resulting in the creation of the School of Public Health. In 1985 I was appointed as the first Dean of the School of Public Health, while remaining employed by the Department of Health. The School remains unique among schools of public health as being a full partnership between a university and a state health agency. I held the position of Dean until 1998, when I changed my state of employment to the University and became the Director of the Institute for Health and the Environment, a position I hold today. The Institute has been designated as a Collaborating Center of the World Health Organization. I am a public health physician, whose research goals are to prevent human disease by preventing exposure to hazardous substances. I have published a total of over 350 papers in peer reviewed journals, have edited five books and have numerous other publications in books and reviews.

Holding a Cell Phone Close to the Head Increases Exposure to Radiofrequency Radiation and Increases Risk of Cancer:

Until recently there has been relatively little attention to the health hazards of RF electromagnetic field exposures at intensities that do not cause tissue heating. However recent studies show that use of a cell phone held to the head over a long period of time results in an increase in risk of brain cancer, and this has resulted in RF radiation being declared a "possible human carcinogen" by the International Agency for Research on Cancer, part of the World Health Organization (IARC, 2013). Because the latency between an environmental exposure and the development of brain cancer is known to be long (often reported to be 20 to 30 years), there is great concern that the very recent increase in use of cell phones may soon be reflected in a significant increase in rates of brain cancer.

The strongest evidence for an association between use of cell phones and development of brain cancer comes from Europe, especially Scandinavia, where cell phones were initially manufactured and have been in wide use for a longer period of time than in other parts of the world. In a meta-analysis (a review and evaluation of multiple research studies), Hardell et al. (2008) reported an odds ratio (OR) of 2.0 (95% CL = 1.2-3.4) for glioma among adults who have used a cell phone for ten years or more, but only on the side of the head where the phone was used. (An odds ratio is the ratio of disease found in the exposed population as compared to those not exposed. Thus an OR of 2.0 means that the risk of developing a brain tumor was doubled in those who used a cell phone for 10 or more years as compared to those did not use a cell phone. CL stands for confidence limit, and if the lower number is greater than 1.0 epidemiologists consider that the relationship is statistically significant.) There was also an OR of 2.4 (95% CL = 1.1-5.3) for acoustic neuroma among long-term users. Acoustic neuromas are a benign tumor of the auditory nerve, but they, like other brain tumors, can be life-threatening because they are space occupying and grow within the bony skull. Risks for meningioma, another type of brain cancer, were elevated, but not significantly so.

The INTERPHONE study was a 13-nation investigation coordinated by the World Health Organization (WHO), and the first results were published in 2010 by The Interphone Study Group. While no excess risk of brain cancer was reported when comparing individuals who had ever used a cell phone to those who had not, there was more than a doubling of risk of brain gliomas in individuals who had used a cell phone for 10 years or more, a 1.8-fold elevated risk if they had used a cell phone for 1640 hours or more, and a 1.3-fold elevated risk if they had made more the 270 calls. The elevation in risk was only on the

side of the head where the cell phone was regularly used. The Israeli component of this study found an elevated risk of parotid gland cancer on the side of the head with long-term cell phone use (Sadetzki et al., 2008). The parotid gland is one of the salivary glands, but is located in the cheek, near to where a cell phone would be used.

There is reason for particular concern about risks to children who use cell phones. Hardell et al. (2004) studied relative risk based on the age when a person began to use a cell phone. For use of either analog or cordless phones when assessed at >1 or >5 year latency, he found that individuals whose use began while they were in their 20s has higher ORs for brain cancer than those whose use began at an older age. Later Hardell and Carlberg (2009) reported that **children who began use of a cell phone prior to the age of 20 had an OR of developing glioma of 5.2 (95% CL = 2.2-12) after only one+ year of cell phone use,** while for all ages the OR was 1.4 (95% CL = 1.1-1.7). The same relative relationship was seen with use of a cordless phone, where use before the age of 20 years gave an OR of 4.4 (95% CL = 1.9-10), whereas for all ages the OR was 1.4 (95% CL = 1.1-1.8). These studies support the conclusion that use of cordless phones also increases risk, and that children are more vulnerable to risk of brain cancer than adults. **The elevated risk to children poses a major concern given the current extensive use of cell phones, even by young children, and these results indicate that children are at least five times more vulnerable for development of brain cancer as compared to adults.**

The RF exposure from holding a cell phone close to the head results in penetration of the radiation into the brain tissue, as shown by models of the human brain, and the depth of penetration is greater in children than adult because of the smaller head size and the thinner skull bones (Gandhi et al., 1996). Even in adults a cell phone held to the head increases brain metabolism (Volkow et al., 2012), proving that the RF radiation has biological effects. However the RF radiation falls off rapidly with distance, and exposure is minimal if the cell phone is even a few inches away from the body. Thus use of a wired ear piece or a speaker phone will allow safe use without increasing risk of cancer.

The Cost of Doing Nothing:

At present we do not know precisely to what degree the risk of cancer is increased by exposure to RF fields from cell phones. Most studies to date have relied on self-reports of how frequently individuals used their cell phone ten years ago, and this is difficult to remember with any certainty. This makes exposure assessment extremely poor. Given the long latency for development of cancer, one would expect that the actual risk of RF-induced cancer is significantly greater than that indicated by studies with inadequate exposure assessment.

There is considerable evidence that children are more vulnerable to many environmental insults than are adults (Ginsberg, 2003). The reality is that children are using cell phones at increasing rates and for long durations. Therefore, given the evidence that the risks are real and children are more susceptible, we may be facing an epidemic of brain and other cancers. The concern is increased because to date there has been little warning advising restrictions on use of cell phones, especially by children, or how cell phones can be used safely. **The evidence for a relationship between cell phone exposure and cancer is sufficiently strong so as to demand action now.** The alternative may be significant increases in certain cancers, especially leukemia and brain cancer. It is not clear whether there is increased risk of other kinds of cancer following exposure because there has not been a study of, for example, the health hazard of wearing a cell phone on your belt and pelvic cancers. There is, however, strong evidence that exposure of

the testis to RF from a cell phone on the belt results in a reduction in sperm count (La Vignera et al., 2012).

The State of Maine would be wise to place warnings on cell phones so that children (and adults) can use them safely. We are not advocating that cell phones not be used, only that the public be made aware of the risks of using them close to the body. Through education and use of common sense both children and adults can enjoy the benefits of modern technology without increasing their risk of serious disease.

In summary, there is at present clear evidence that exposure to excessive levels of RF radiation from cell phones increases risk of cancer, and this evidence is rapidly growing. The risk is greater for children, who are the most vulnerable members of our society and those on whom our future is most dependent. We are not going to go back to a pre-wireless age, but we need rather to find ways in which to use contemporary technology safely and learn to balance risks against benefits.

David O. Carpenter, MD

References:

Gandhi OP, Lazzi G, Furse CM. (1996) Electromagnetic absorption in the human head and neck for mobile telephones at 835 and 1900 MHz. IEEE T Microw Theory. 44: 1884-1896.

Ginsberg GL. (2003) Assessing cancer risks from short-term exposures in children. Risk Anal. 23: 19-34.

Ha M, Im H, Lee M, Kim HJ, Kim BC, Gimm YM, Pack JK. (2007) Radio-frequency radiation exposure from AM radio transmitters and childhood leukemia and brain cancer. Am J Epidemiol. 166: 270-279.

Hardell L, Carlberg M. (2009) Mobile phones, cordless phones and the risk for brain tumours. Int J Oncol. 35: 5-17.

Hardell L, Mild KH, Carlberg M, Hallquist A. (2004) Cellular and cordless telephone use and the association with brain tumors in different age groups. Arch Environ Health. 59: 132-137.

IARC (International Agency for Research on Cancer) (2013) *Non-Ionizing Radiation, Part 2: Radiofrequency Electromagnetic Fields.* IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. World Health Organization. 461 pp.

INTERPHONE Study Group. (2010) Brain tumour risk in relation to mobile telephone use: results of the INTERPHONE international case-control study. Int J Epidemiol. 39: 675-694.

La Vignera S, Condorelli RA, Vicari E, D'Agata R, Calogero AE. (2012) Effects of the exposure to mobile phones on male reproduction: A review of the literature. J Androl 33: 350-356.

Sadetzki S, Chetrit A, Jarus-Hakak A, Cardis E, Deutch Y, Duvdevani S, et al. (2008) Cellular phone use and risk of benign and malignant parotid gland tumors--a nationwide case-control study. Am J Epidemiol. 167: 457-467.

Volkow ND, Tomasi D, Wang GJ, Vaska P, Fowler JS, Telang F, et al. (2012) Effects of cell phone radiofrequency signal exposure on brain glucose metabolism. JAMA. 305: 808-813.

Why It Is Important to Protect Children From Wireless Radiation

David O. Carpenter, MD
Institute for Health and the Environment
University at Albany
dcarpenter@albany.edu

Cell Phones

- As of 2007 there were 3.3 billion cell phone subscriptions, equal to half the world's population.
- There is strong evidence that use of cell phones held to the head increases risk of brain cancer.
- The World Health Organization has declared radiofrequency radiation to be a possible human carcinogen.
- The latency for brain cancer from environmental exposures is usually thought to be 20-30 years.
- If cell phone use causes brain cancer we have a major problem, and it will get worse over time.

Cell Phone Use for 10+ Years and Ipsilateral Glioma: Results from Meta-Analyses and Reviews

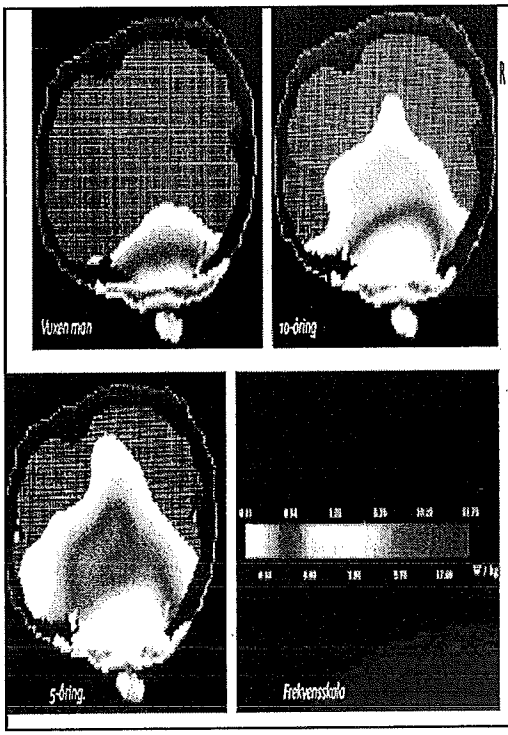
- From Individual Studies:
  - Lonn et al., 2005; OR = 1.60 (0.80-3.40)
  - Hepworth et al. 2006; OR = 1.60 (0.92-2.76)
  - Lahkola et al., 2007; OR = 1.39 (1.01-1.92)
  - Hardell et al., 2008; OR = 4.40 (2.50-7.60)
  - Interphone, 2010; OR = 1.57 (1.13-2.30)
- From Meta-Analyses:
  - Hardell et al., 2008; OR = 2.0 (1.2-3.4)
  - Kundi, 2008; OR = 1.9 (1.4-2.4)
  - Khurana et al., 2009; OR = 1.9 (1.4-24)
  - Myung et al. 2009: OR = 1.18 (1.04-1.34)
  - Levis et al., 2011; OR = 1.58 (1.21-2.00)

The INTERPHONE Study by the World Health Organization

- This was a 13-country study of cell phone use and brain cancer, including Canada but not the US.
- Use of a cell phone for 10+ years resulted in a 2.18-fold increase in risk of glioma, use for 1640+ hours resulted in a 1.82-fold increased risk and making more than 270 calls resulted in a 1.31-fold increased risk of glioma.

Susceptibility of Children

- Hardell and Carlberg reported on risk of glioma as a function of age of beginning use of a cell phone. The following is after > 1 year of cell phone use:
  - All ages: OR = 1.4 (1.1-1.7)
  - <20 years: OR = 5.2 (2.2-12.0)
  - 20-49 years: OR = 1.5 (1.1-2.0)
  - 50-80 years: OR = 1.3 (0.97-1.7)

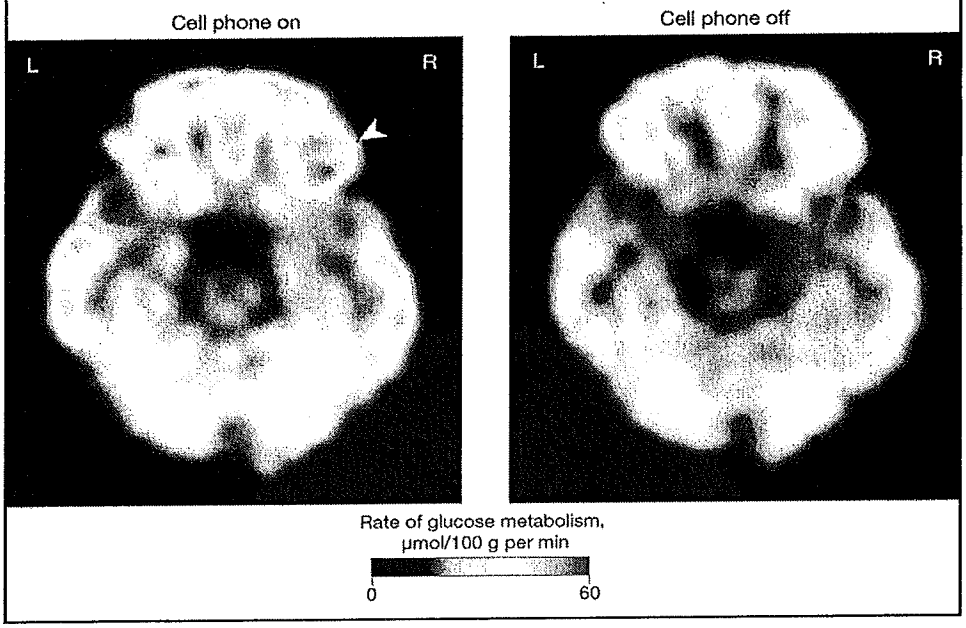


Adult man, 10 years child, 5 years child frequency scale.

GSM phone 835 MHz with SAR in Watt/Kg.

From Professor Om Gandhi with thanks.

Glucose metabolism and cell phones (Volkow et al., 2011)



Steps to Reduce Exposure to RF Fields from Cell Phones

- 1. Use a landline whenever possible.
- 2. Send text messages whenever possible.
- 3. If you must use a cell phone, use an headset rather than holding the phone close.
- 4. Don't allow children to use a cell phone except in an emergency.
- 5. Don't keep an active phone in your belt pocket, which only exposes other body parts.
- 6. Don't sleep with the phone on next to your body.

Conclusions

- There is already convincing evidence for an elevation in risk of brain and other cancers from use of cell phones.
- Because of the long latency for these diseases and the limits of current exposure assessment, we almost certainly underestimate that real risk.
- The "Children's Wireless Protection Act" will inform children and their parents that there are risks associated with excessive use of cell phones held to the head. Education is key!
- The precautionary principle (and common sense) requires that we take action now to reduce exposure.