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Introduction

I am a Senior Managing Scientist in Exponent's Health Sciences Center for Epidemiology, Biostatistics, and Computational Biology, and I have 30 years of experience in environmental epidemiology and health risk assessment. I earned a Ph.D., in Epidemiology from the University of Oklahoma in 1979, and an M.S., Biostatistics and Epidemiology in 1977. My work includes assessing epidemiological research and integrating this information with that from other disciplines for qualitative and quantitative risk assessments. I have prepared analyses of complex epidemiological evidence for environmental and occupational chemicals, radiofrequency energy, electric and magnetic fields (EMF), and stray voltage, and have published in the peer reviewed scientific literature. I have been particularly active in updating standards regarding non-ionizing radiation, both low frequencies (EMF) and radio frequencies. I have served on advisory committees to government, regulatory organizations, and industry regarding health risk assessments of chemicals and electromagnetic fields.

Background

Mobile phones operate using radio waves. Radio waves, or radiofrequency (RF) energy, is a range of the electromagnetic spectrum that includes AM and FM broadcast radio, television, and many other devices and technologies including cordless phones, baby monitors, radar, and microwave ovens. Visible light is also part of the electromagnetic spectrum, but is at a higher frequency and shorter wavelength than RF. RF energy is not "radiation" in the same sense as used for high frequency X rays, because the energy of RF is so much lower and is unable to change the DNA of cells. Although RF energy is sometimes referred to as "EMF" the contemporary usage of EMF refers primarily to the electric and magnetic fields associated with electricity from power lines and all electric devices. Electricity operates in the extremely low frequency (ELF) range, 60 cycles per second (60 Hz), in the United States. To avoid confusion, I will use RF in my discussion of mobile phones.

Standard scientific methods are used to assess possible risks to human health. The standard scientific approach used to determine whether an exposure source, such as to RF energy, poses a health risk, is to look at all of the available research, including both studies that have reported effects, and those that did not. The goal is an objective, comprehensive review, in which the strengths and weaknesses of each study are evaluated, and more weight is given to studies of better quality. This

approach is designed to ensure that reviewers do not single out studies, consciously or inadvertently, to support a preconceived opinion. Then, all of the studies are evaluated together to arrive at a conclusion. This is the method that I have used for evaluating the RF research and for other assessments throughout my career.

The relevant research to be considered includes a broad spectrum of scientific research that uses different approaches to study potential effects of RF energy on humans. These different approaches have different strengths and limitations and provide complementary information: laboratory studies in cells and in animals, experimental studies of human volunteers, and epidemiologic studies of human populations. For this reason, scientific organizations convene panels of independent experts from the various areas of expertise (e.g. health physics, engineering, toxicology, clinical medicine, and epidemiology) relevant to the topic. Many scientific organizations consider pertinent studies to be those reports of scientific research or reviews that have been published or accepted for publication in the peer-reviewed scientific literature (IARC, 2006; WHO, 2007).

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Independent scientific organizations worldwide have reviewed the research and proposed exposure limits. Many studies have been conducted over the past 50 years to examine whether exposure to RF energy has adverse effects on health, and to determine allowable levels of exposure. Several scientific organizations have reviewed the laboratory and epidemiologic research to assess the potential for health effects from RF exposure, and to set exposure limits to ensure occupational and public safety. These expert groups have included scientists with diverse skills to reflect the different research expertise required to answer questions about RF energy and health. Numerous government agencies and professional organizations have reviewed the science related to potential health effects from using wireless phones. While the specific conclusions vary, all of the reports that assess the evidence using multidisciplinary panels and a comprehensive approach reach similar conclusions; the current scientific evidence does not demonstrate that wireless phones cause cancer or other adverse health effects.

The Federal Communications Commission (FCC) and the Food and Drug Administration (FDA), the agencies with regulatory authority over radiofrequency emissions in the U.S., have both concluded that the current scientific evidence does not indicate that there are health hazards from using a wireless phone. The FCC's website states that "[t]here is no scientific evidence that proves that wireless phone usage can lead to cancer or a variety of other problems, including headaches, dizziness or memory loss."(www.fcc.gov/cgb/cellular.html#evidence) The FDA's website similarly states that "[t]he weight of scientific evidence has not linked cell phones with any health problems."(http://www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/HomeBusinessandEntertainment/Ce llPhones/ucm116282.htm)

In September 2008, the National Cancer Institute (NCI), the U.S. government's principal agency for cancer research, published a Fact Sheet on Cellular Telephone Use and Cancer Risk that concluded that there is no consistent link between cellular telephone use and cancer.[1] The NCI also stated that "incidence data from the Surveillance, Epidemiology, and End Results (SEER) program of the National Cancer Institute have shown no increase between 1987 and 2005 in the age-adjusted incidence of brain or other nervous system cancers despite the dramatic increase in use of cellular telephones."[2] http://www.cancer.gov/cancertopics/factsheet/Risk/cellphones.

The conclusions of these U.S. agencies are similar to the conclusions reached in reports prepared by various commissions and agencies around the world, including for example:

- **The Australian Radiation Protection and Nuclear Safety Agency (2009)**

  "There is essentially no evidence that microwave exposure from mobile telephones causes cancer, and no clear evidence that such exposure accelerates the growth of an already-existing cancer." http://www.arpansa.gov.au/mobilephones/index.cfm

[1] *See* http://www.cancer.gov/cancertopics/factsheet/Risk/cellphones.
[2] *Id.*

• **Health Canada (2007)**

"There is no convincing scientific evidence that RF exposures have any link to cancer initiation or promotion. The body of peer-reviewed literature in this area overwhelmingly demonstrates a lack of linkage, and where the few reports of linkage effects were found, some may be attributed to factors other than RF energy."

• **The Health Council of the Netherlands (2008)**

"The Committee maintained its conclusion that no causal link has thus far been demonstrated between health problems and exposure to electromagnetic fields generated by mobile phones or base stations for mobile telephony."
http://www.gezondheidsraad.nl/sites/default/files/200902.pdf (English version starts at page 65).

• **The Scientific Committee on Emerging and Newly Identified Health Risks of the European Commission (2009)**

"Overall, research indicates that mobile phone use does not increase the risk of cancer, especially when used for less than ten years."
http://ec.europa.eu/health/opinions2/en/electromagnetic-fields/index.htm#3

• **The World Health Organization (2006)**

"Considering the very low exposure levels and research results collected to date, there is no convincing scientific evidence that the weak RF signals from base stations and wireless networks cause adverse health effects."
http://www.who.int/mediacentre/factsheets/fs304/en/index.html

The United Kingdom's Health Protection Agency and New Zealand Ministry of Health's National Radiation Laboratory also have reached similar conclusions after reviewing the available science.

In September 2009, the International Commission on Non-Ionizing Radiation Protection's (ICNRP) Standing Committee on Epidemiology published a scientific review of all of the available epidemiologic evidence on wireless phones and brain tumors. That review concludes:

> "In the last few years, the epidemiologic evidence on mobile phone use and risk of brain and other tumors of the head has grown considerably. In our opinion, overall the studies published to date do not demonstrate a raised risk within approximately 10 years of use for any tumor of the brain or any other head tumor." (Ahlbom et al, 2009)

Conclusion

Based on my review of the epidemiologic studies and consideration of experimental data in animals, I agree with the conclusions of the scientific organizations: The current scientific evidence does not demonstrate that wireless phones cause cancer or other adverse health effects

References

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