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Date: August 3, 2007

From: Janet Newton, President

To: National Academy of Sciences  
Committee on Identification of Research Needs Relating to Potential  
Biological or Adverse Health Effects of Wireless Communications Devices  
Keck Center  
500 5th Street, NW  
Washington D.C. 20001

PIN: NRSB-O-06-02-A

Major Unit: Division on Earth and Life Studies

Sub Unit: Nuclear and Radiation Studies Board

RSO: Rick Jostes

Attention: Shauntee Whetstone

RE: **RESEARCH GAPS IN KNOWLEDGE ABOUT BIOLOGICAL OR  
ADVERSE HEALTH EFFECTS OF WIRELESS  
COMMUNICATIONS DEVICES THAT NEED TO BE FILLED**

**The impact of long-term exposure to radiofrequency (RF) radiation generated by antennas sited in very close proximity to homes, workplaces and schools is one of the most significant gaps in RF research.** No wireless device, be it a cell phone, a pager, a device with wireless internet connectivity, or any receiver of television or radio broadcasts, operates by itself. All such devices require antenna sites for their operation. Because biological effects that correlate to increases in RF exposure have been found in populations exposed to antenna radiation at levels 100 times lower than the FCC limits, it is critical to determine if these biological effects can cause harm. (See: Burch JB *et al*, "Radio frequency nonionizing radiation in a community exposed to radio and television broadcasting." *Environmental Health Perspectives*, 2005. Feb;114(2):248-53; and Reif, John S. *et al*, "Human Responses to Residential RF Exposure." August 23, 2005.) **There is a great need for research to identify the links between low-intensity RF radiation exposures and the biological effects that have been demonstrated in epidemiology studies.**

From broadcast RF radiation exposure;

- Adult and childhood leukemia
- Elevated incidence of brain cancer

- Altered immune function, i.e., increase in number of T-cell lymphocytes
- Neurological and developmental impairment

From mobile phone antenna RF radiation exposure:

- Headache
- Dizziness
- Depressive symptoms
- Tremors
- Sleep disturbance
- Fatigue
- Irritability
- Loss of memory
- Appetite
- Nausea
- Visual disturbances

**The levels and characteristics of RF radiation present in workplaces and residential neighborhoods now and into the future need to be quantified and monitored.** It is impossible to make wise choices or practice sound science without ascertaining facts as to the amount of actual RF exposure. Imagine climatologists predicting future weather without ever examining temperature readings over time.

There is no federal research program in place to quantify the current RF radiation levels present in workplaces and residential neighborhoods across the country. The last time a comprehensive study was done on the amount of general population RF radiation exposure was over 20 years ago. The general population's exposure to RF levels and the types of RF are rapidly increasing. Because broadcast and wireless devices can be and are used in every aspect of daily living, people are now exposed, many chronically or continuously, to non-thermal levels of RF radiation in the workplace, at schools, in daycare centers, in hospitals, in automobiles, in transportation facilities, and in their homes.

**The research needs to examine what actually happens when people other than a 6 feet tall hypothetical man (not on medications, not elderly, etc) are exposed to RF.** The FCC RF limits are based on the false assumption that what RF does to the body of a man applies equally to children, women, people on medications, etc. In the United States, in the standards set by both the IEEE (Institute of Electrical and Electronics Engineers) and the NCRP (National Council on Radiation Protection and Measurement) and adopted by the FCC, **the human exposure model is an adult male of average height and weight.** Short-term acute exposures are extrapolated downward to set standards for long-term low-intensity exposures. The standards do not take women, pregnant women, or children into consideration – all of whom absorb radiation differently than this “average” male model. Neither do they consider the elderly or the infirm who are more susceptible to adverse exposures.

**Simply put, “Can anyone be harmed by RF below the levels required to heat a 6 ft. tall man?”** There is substantial scientific evidence that biological changes take place at levels far below this. (See PowerPoint presentation of Theodore Litovitz, PhD, “Biological Effects of Electromagnetic Fields,” prepared for a 2001 Congressional staff briefing found at: [www.emrpolicy.org/files/litovitz\\_files/frame.htm](http://www.emrpolicy.org/files/litovitz_files/frame.htm))

**The 14 gaps in research identified by the U.S. Federal Agencies who comprise the Radiofrequency Interagency work Group (RFIAWG) and conveyed to the IEEE RF standards setting subcommittee**

**must be addressed.** See the attached June 17, 1999 letter from the scientific experts at the US federal health agencies identifying 14 specific issues in the current US RF safety policy that, “we believe need to be addressed to provide a strong and credible rationale to support RF exposure guidelines.” **To date these issues have not been addressed in any federal research program. They constitute a comprehensive list of gaps and needs in RF radiation research:**

- Biological basis for local SAR [Specific Absorption Rate] limit
- Selection of an adverse effect level  
Selection criteria that could be considered in determining unacceptable/adverse effects include:
  - a) adverse effects on bodily functions/systems
  - b) minimal physiological consequences
  - c) measurable physiological effects, but no known consequences
- Acute and chronic exposures
- One tier vs. two tier guidelines
- Controlled vs. uncontrolled (applicability of two IEEE exposure tiers)
- Uncertainty factors
  - (1) extrapolation of acute effects data to chronic exposure conditions,
  - (2) uncertainty in extrapolating animal data to humans in prolonged exposure situations,
  - (3) variation in the susceptibility (response/sensitivity) among individuals,
  - (4) incomplete data bases,
  - (5) uncertainty in the selection of the effects basis, inability of any single study to adequately address all possible adverse outcomes.
- Intensity or frequency modulated (pulsed or frequency modulated) RF radiation
- Time averaging
- Lack of peak (or ceiling) limits for induced and contact current
- Criteria for preventing hazards caused by transient discharges
- Limits for [continuous] exposure at microwave frequencies
- [Definition of] Replication/Validation
- Important Health Effects Literature Areas:
  - 1) long-term, low-level exposure studies (because of their importance to environmental and chronicoccupational RFR exposure);
  - 2) neurological/behavioral effects (because of their importance in defining the adverse effect level in existing RFR guidelines); and
  - 3) micronucleus assay studies (because of their relevance to carcinogenesis).
- Compatibility of RFR guidelines

In the United States the gaps in the research on potential adverse health effects from RF radiation have led directly to a federal regulatory void in protecting the general public from this ever-increasing environmental exposure. The research needs that remain unaddressed have hampered the development of responsible public policy at a time when the public’s exposure has become ubiquitous and, in many cases, continuous.

**The US RF safety guidelines do not directly address chronic or continuous low-intensity exposures.**

The US model, and all of the research it is drawn from, is based solely on the thermal effects RF radiation can create. It has been known for decades that microwaves, at sufficient power output, can create heating as in a microwave oven. **The current US model presumes that nothing adverse other than heating occurs. Therefore, if heating does not occur, no other adverse biological effect does either.** But for decades a

range of adverse non-thermal effects have been noted as well – at levels significantly lower than the current US standard.

The epidemiology studies cited below point out the need for further studies of the population groups in residential areas that are in proximity to broadcast and personal wireless antenna sites as well as workers whose occupations require them to be exposed to RF radiation in the workplace.

The *amicus curiae* briefs of the Healthy Schools Network (HSN) and the International Association of Firefighters (IAFF) cited below and the attached article from *Across the IAFF* come from organizations representing two population groups **that are required by law or by employment to spend significant time daily and throughout their lifetimes in locations where wireless antennas and transmitters are often sited, i.e., school children and school employees; and firefighters and first responders.** Their exposure scenarios relate directly to several of the RFI/EMF Issues.

School populations and firefighters/first responders are examples of how many in the general public are now exposed to RF radiation on **a continuous basis, many throughout their lifetimes, in their workplaces as well as in residential neighborhoods where most schools and daycare facilities are located.** Existing studies have looked at exposures of significantly shorter duration than the lifelong exposures these groups will experience going forward.

Please note the following in the *Amicus Curiae* brief of Healthy Schools Network:

- p. 1 Interest of HSN in “assuring every child and school employee an environmentally safe and healthy school, through research, information, advocacy, and coalition building.”
- p. 4 HSN concern that **“a significant threat to the health of school children and personnel in posed by RF radiation** from cell towers placed on or near schools or day care centers . . . **for which no one is currently assuming responsibility. Because of their greater vulnerability, inability to avoid exposure, and lengthy school-day,”** the need for evaluating increasing RF radiation exposure is **“more compelling for the 54 million children in public and private schools in the United States than either the adult population or the general population at large.”**
- pp. 7-11 “. . . the present scientific debate is over whether there are ‘non-thermal’ effects that are not mediated by tissue heating. The answer is that some, but not all, studies of humans indicate that non-thermal RF fields do cause harm to humans. We will now summarize the available information.”
- p. 11 The potential for RF radiation harm is greater for children and for schools.
- p. 12 **No studies to date have focused on exposure to children.**
- p. 16 **“One common fact** that HSN repeatedly finds accompanying discovery of harmful exposures in schools **is that no agency is charged with protecting children’s health, or watching out for dangers in the school.”**
- p. 17 **“Children, the most numerous potential victims, cannot be expected to provide safety oversight for themselves, nor to self-advocate.”**
- p. 22 Appendix B – The specific language on point from the citations [published research papers] at page 9.
- pp.25-29 Appendix E -- Policy Statement #200011, American Public Health Association (APHA), contained in *American Journal of Public Health*, Vol. 91, No. 3 at pp20-21. **“Recognizing that, for centuries, the cornerstone of public health policy and practice has been the prevent injury and disease . . .”**

Please note the following in the *Amicus Curiae* brief of The International Association of Firefighters, headquartered in Washington, DC, representing more than 280,000 full-time professional fire fighters and paramedics who protect 85 percent of the population in the United States and Canada:

- p. 1-2 **The mission of the IAFF is to protect the safety and health of the public by ensuring its members that their workplaces are safe.**
- p. 3 IAFF support for the studies of “the potential health effects of low-intensity RF/MW radiation in those working and living in close proximity to wireless communications towers and/or antennas.”
- p. 4 **IAFF efforts to secure funding for studies that “would compare and contract illnesses experienced by fire fighters and paramedics working out of facilities with cellular telephone towers and/or antennas with those of fire fighters working out of facilities without such towers and/or antennas.”**
- p. 5 **IAFF’s belief “that its members should not be required to live with doubts as to whether their exposure to low-intensity RF/MW radiation is subjecting them to risks beyond those related to their already risky professions.”**

The article from the May/June 2007 issue of the IAFF’s members’ publication *Across the IAFF* entitled “Critical Questions on Health Risks of Cell Tower Exposure,” **points out the increased RF radiation exposure when fighting fires on buildings with “stealth design” antenna sites where the firefighters come in closer contact to RF radiation sources. Firefighters often have no idea if they are being exposed at fire sites.** “The IAFF is working to ensure fire departments know the location of these hidden hazards before fire fighters respond to emergency calls.”

There is a great need for occupational health studies of the millions of additional American workers who face the same lack of knowledge and training as this IAFF article describes. Painters, roofers, windows washers, air conditioning and elevator repairmen and other service employees who work on rooftops or on the sides of buildings where “stealth” antenna site are located are exposed to RF emissions at levels allowed in the FCC’s “controlled environment”.

Unlike the communications workers who install and repair antennas and are required to be trained and to be given personal radiation monitors to warn them when RF levels reach dangerous levels, these other workers are left ignorant and defenseless. It is possible and likely that a worker on a job site who is in direct line with the main beam of a mobile phone antenna is exposed to RF radiation at a level 200 times stronger than occurs by holding a cell phone to his head.

The appendices of the ANSI/IEEE standards document specific harmful effects of these high-level RF exposures that are often not apparent to the worker:

- Changes to brain chemistry such as serotonin and dopamine levels which affect brain function, learning ability, moods, etc. (IEEE B.5.2.3).
- Changes to hormone levels and the immune system (IEEE B.6.2.1).
- Changes to the Blood Brain Barrier which allow chemicals and viruses to pass into the brain and central nervous system (IEEE B.5.6.3).

Given the proliferation of all manner of consumer electronic devices, high-definition television and radio, and the buildout of the antenna infrastructure required for these technologies to operate, millions in the general population will be exposed chronically and repeatedly to nonthermal levels of RF radiation throughout their entire lifetimes. The gaps in this area of RF radiation research are enormous, as are the public health implications of ignoring these exposures.

**There is currently no US federal health agency with the budget, personnel, or mandate from Congress to protect children, workers, or the general public from antenna site RF radiation exposure. As a result, the American public is unprotected.**

References:

June 17, 1999 letter from W. Greg Lotz, federal Radiofrequency Interagency Work Group (RFIAWG) to Richard Tell, Chair, IEEE SCC28 (SC4) Risk Assessment Work Group laying out fourteen RF Guideline Issues identified by members of the federal RF Interagency Work Group. (See attached.)

September 5, 2006 Brief of Healthy Schools Network, Inc., as *Amicus Curiae* in Support of Petition No. 06-175 in the Supreme Court of the United States. (Cert. denied.) (See: [www.emrpolicy.org/litigation/case\\_law/docs/5sep06\\_amicus\\_hsn.pdf](http://www.emrpolicy.org/litigation/case_law/docs/5sep06_amicus_hsn.pdf)).

May, 2005 Brief of The International Association of Fire Fighters, AFL-CIO, CLC as *Amicus Curiae* in Support of Petition No. 04-1515 in The Supreme Court of the United States. (Cert. denied.) (See: [www.emrpolicy.org/litigation/case\\_law/docs/iaff\\_amicus\\_brief.pdf](http://www.emrpolicy.org/litigation/case_law/docs/iaff_amicus_brief.pdf)

“Critical Questions Remain on Health Risks of Cell Tower Exposure.” *Across the IAFF*, May/June 2007, p. 30. (See attached.)

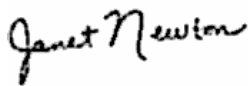
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Santini R, Santini P, Danze JM, Le Ruz P, Seigne M. Survey Study of People Living in the Vicinity of Cellular Phone Base Stations. *Electromagnetic Biology and Medicine*: Vol. 22, No. 1, pp.41-49, 2003. (Abstract attached).

Submitted by:



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