

The Royal Society of Medicine

June 14, 2023



Towards the better protection of people and planet from wireless radiation:
Work of the New Hampshire Commission and the ICBE-EMF

International Commission on Biological Effects of Electromagnetic Fields

Prof. Kent Chamberlin, Ph.D.
Professor & Chair Emeritus
Dept. of Electrical & Computer Engineering
University of New Hampshire, USA



Conflict-of-Interest Statement

- My position at the time I joined the New Hampshire State Commission was Professor & Chair of the Dept. of Electrical & Computer Engineering at the University of New Hampshire.
- Since leaving the university, I have been a founder in a high-tech startup.
- My bias was and is generally in favor of technological developments.
 - Served on the InterOperability Laboratory Advisory Board, which is an international evaluator of wireless networking technologies.
 - Active in Project 54, addressing the communications needs of police and first responders.
 - Serve as Chair of the Virtual Learning Academy Charter School Board of Trustees
- Served on the New Hampshire Commission without any compensation, including travel expenses.
- Because of my service on the Commission, I am asked to present to various groups, none of which have involved compensation.
- I present to you today as a citizen, with no realized or expected financial rewards.

New Hampshire
Legislation
Proposing the
Formation of a
Commission to
Explore Wireless
Radiation

- The five-page bill ([House Bill 522](#)) that they wrote was submitted in June 2019.
- That legislation was passed by the legislature with bipartisan support and was signed by the Governor, a Republican, in July 2019.
- The bill called for the formation of a commission that would take a deep look into the impacts of wireless radiation exposure.
 - This is the first legislation passed in the United States calling for the formation of a commission to explore the health effects of wireless radiation.

Some of the Questions Posed to the Commission

- Why does the insurance industry recognize wireless radiation as a risk, but will not insure for damages caused by it?
- Why have the many hundreds of peer-reviewed studies showing harm from wireless radiation been ignored by the ICNIRP and the FCC?
- Why are ICNIRP/FCC guidelines based solely on thermal effects, when non-thermal effects have been documented?
- Why did the World Health Organization classify wireless radiation as a possible carcinogen, and why is that fact being ignored by ICNIRP and the FCC?

Specified Commission Membership

- The legislation forming the Commission was very specific about who the membership should be:
 - Three members from the NH House of Representatives two members from the NH Senate
 - A member of the public appointed by the Governor
 - The State Attorney General, or designee
 - Two members of the NH High Technology Council
 - One member from the Business and Industry Association
 - One member from the NH Medical Society
 - One member from the university with background in radiofrequency radiation
 - One member from the mobile phone/wireless technology industry
 - The Commissioner of the Department of Health and Human Services or designee
 - A public member with expertise in biological effects of radiation
- The 13 Commission members had backgrounds that included medicine, physics, toxicology, electromagnetics, epidemiology, biostatistics, occupational health, public health policy, business, and law.

Sources of Information for the Findings of the Commission

- Peer-reviewed and Commission-vetted, publications
- Regulatory agencies (FCC, FDA, EPA).
 - They were invited to meet with the commission, but they did not, nor did they provide sufficient answers our questions.
- Outside experts: all presenters except one provided clear evidence that wireless radiation poses a threat to human health and the environment
 - The presenter who did not acknowledge those risks was the presenter from the telecommunications industry; he was also the only person paid to present

The Vetting of Peer-Reviewed Material

One Objective: address claim made by telecom representatives that the only articles showing harm from wireless radiation are those that are “cherry picked” from “fringe journals.”

My background in vetting of peer-reviewed material: Associate Editor for IEEE publication; Department Chair, Member and Chair of College Promotion & Tenure Committees.

The UNH College of Engineering and Physical Sciences Librarian (PhD in Library Sciences) provided support in the vetting process.

A result of the vetting process is that the peer-reviewed articles used by the New Hampshire Commission to draw its conclusions did not include those from low-quality (“fringe”) publications.

Outcome of Peer-Reviewed Literature Review

- We identified hundreds of top-tier publications that showed harm from low-level wireless radiation exposure.
- [As of 2020](#), the vast majority of peer-reviewed publications showed harm from exposure.
 - 240 out of 261 (91%) of studies showed free radical (oxidative damage) effects resulting from low-level RFR exposure
 - The International Agency for Research on Cancer (IARC) has identified oxidative stress (which can lead to genotoxicity and carcinogenicity) as a common characteristic of several human carcinogens

Oxidative Effects, Primary Mechanism for Wireless Radiation Harm

As noted on the previous slide, the primary mechanism by which exposure causes harm are oxidative changes, which can lead to an increase in free radicals. Those free radicals can lead to chronic inflammation and many of harmful outcomes including:

- **Reproduction (sperm damage and infertility)**
- **Neurodegenerative disease (Alzheimer's)**
- **Cancer**
- **Cardiovascular disease**
- **Diabetes**
- **Chromosome damage**
- **Neuronal DNA damage**
- **Neuropsychiatric effects**

Assessing How the Current ICNIRP/FCC Exposure Guidelines Were Set



Current limits were set in the 1980s and were based on short-term (around an hour) behavioral studies on 8 rats and 5 monkeys (referenced in [ICBE-EMF paper](#)).

- The assumption with these limits is that if a radio signal is not strong enough to warm tissues, it will not cause harm.
- The animals had been trained to press a lever to obtain food pellets, and they were food deprived at the onset of the test.
- The animals were exposed to increasing levels of radiation until they could no longer perform their task; that level was designated as the **threshold dose** for adverse effects of RF radiation.
 - This level of exposure was associated with an approximate increase in body temperature of 1°C , which was *assumed* to not cause adverse health effects.



“Safety Factor” and Whole-Body Averaging

The **threshold dose** was divided by an *arbitrary* “safety factor” (50 for the general population and 10 for workers) to come up with today’s exposure level guidelines

This exposure level is for whole body exposure; local tissue limits are significantly higher (20-25 times).

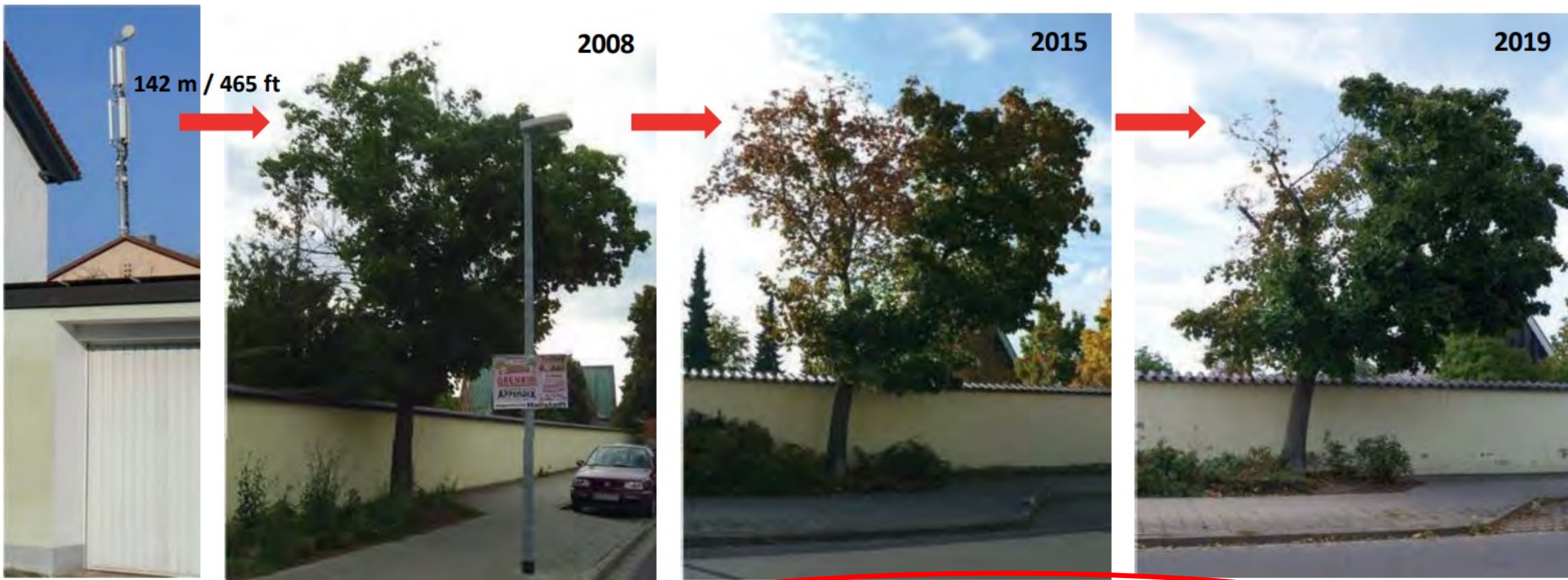
Recap of How ICNIRP/FCC Guidelines Were Set

The ICNIRP/FCC radiation guidelines currently being used today for **lifetime** exposures are based on:

- Studies lasting an hour or less
- A single endpoint attributed to heating effect
- A small sampling of animals (8 rats and 5 monkeys)
- An arbitrary “safety factor”



Example of Long-Term, Very-Low Exposure



Left side of tree: $3380 \mu\text{W}/\text{m}^2$ (0.03% of ICNIRP/FCC limit)
Right side of tree: $500 \mu\text{W}/\text{m}^2$ (0.005% of ICNIRP/FCC limit)

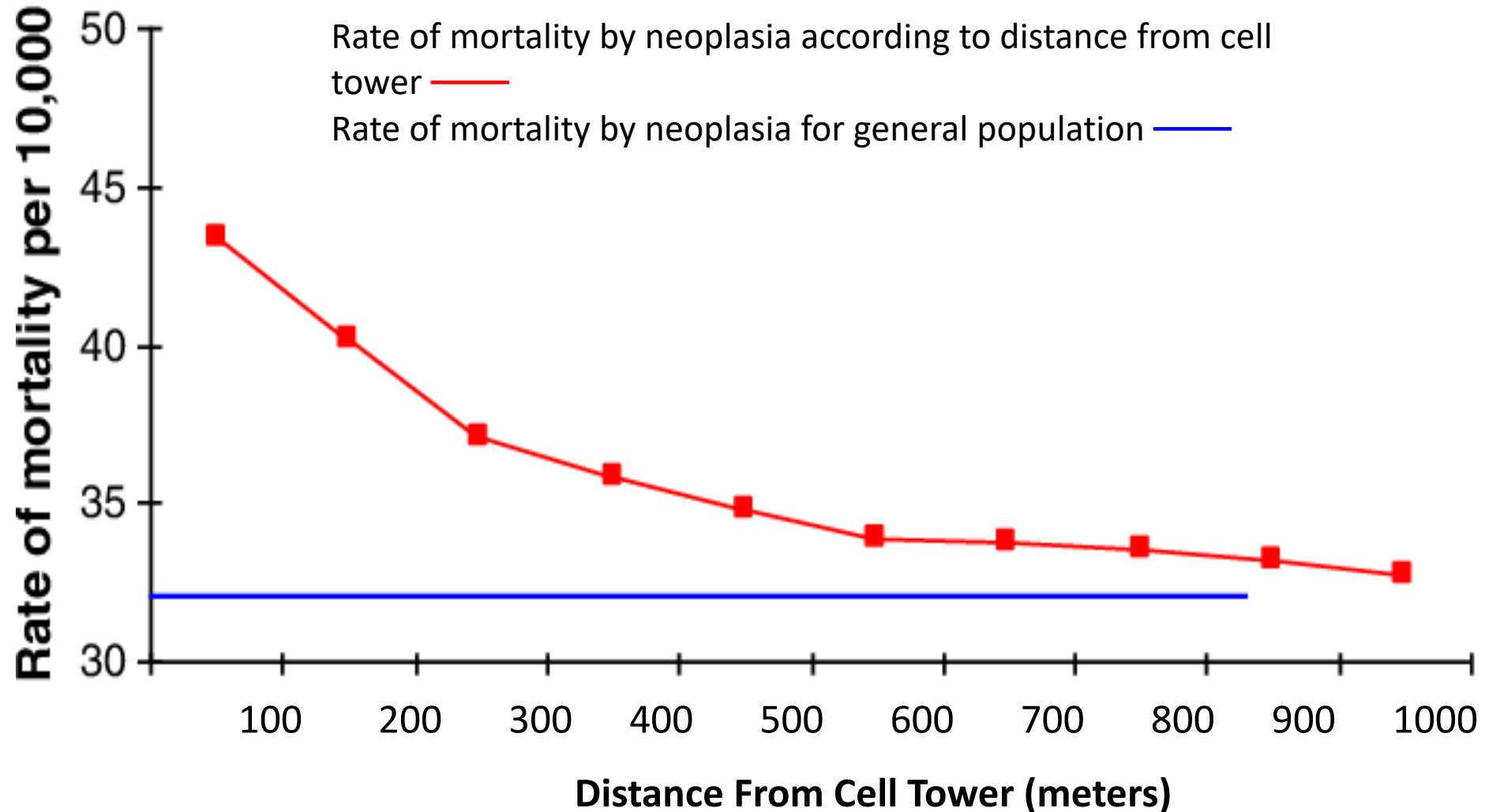
Examples of Studies Showing that Wireless Radiation Has a Negative Effect on Flora and Fauna

- Cornelia Waldmann-Selsam, et. al., “Radiofrequency radiation injures trees around mobile phone base stations, *Science of The Total Environment*”, Volume 572, 2016, Pages 554-569, ISSN 0048-9697, <https://doi.org/10.1016/j.scitotenv.2016.08.045>
- Three-part series by B. Blake Levitt, Henry C. Lai and Albert M. Manville II, “Effects of non-ionizing electromagnetic fields on flora and fauna, *Review of Environmental Health*, [part 1](#), [part 2](#), [part 3](#)
- Balmori, A. Electromagnetic radiation as an emerging driver factor for the decline of insects. *Sci Total Environ* 2021;767:144913. <https://doi.org/10.1016/j.scitotenv.2020.144913>
- S. Cucurachi, W.L.M. Tamis, M.G. Vijver, W.J.G.M. Peijnenburg, J.F.B. Bolte, G.R. de Snoo, “A review of the ecological effects of radiofrequency electromagnetic fields (RF-EMF)”, *Environment International*, Volume 51, 2013, Pages 116-140, ISSN 0160-4120, <https://doi.org/10.1016/j.envint.2012.10.009>
- Lázaro, A., Chroni, A., Tscheulin, T. et al., “Electromagnetic radiation of mobile telecommunication antennas affects the abundance and composition of wild pollinators,” *J Insect Conserv* 20, 315–324 (2016). <https://doi.org/10.1007/s10841-016-9868-8>
- Halgamuge MN. “Review: Weak radiofrequency radiation exposure from mobile phone radiation on plants,” *Electromagn Biol Med*. 2017;36(2):213-235. <https://doi:10.1080/15368378.2016.1220389>

Death Rates from Cancer versus Distance People Live from Cell Tower Transmitter

- Peer-reviewed article: [Mortality by neoplasia \[cancer\] and cellular telephone base stations in the Belo Horizonte municipality, Minas Gerais State, Brazil](#)
 - Explored the relationship between cancer mortality rates and the distance people lived from a cell tower
 - Study investigated a large number of cancer deaths (7,191) and a large number of cell towers (856)
 - Performed during a time when few people had personal electronic devices (1996-2006)
 - Results of study revealed the effects of living near a cell tower
 - The maximum exposure level measured during the study was 407.8 mW/m² which is less than 5% of the ICNIRP/FCC guidelines

Key Finding from the Article Referenced on Previous Slide



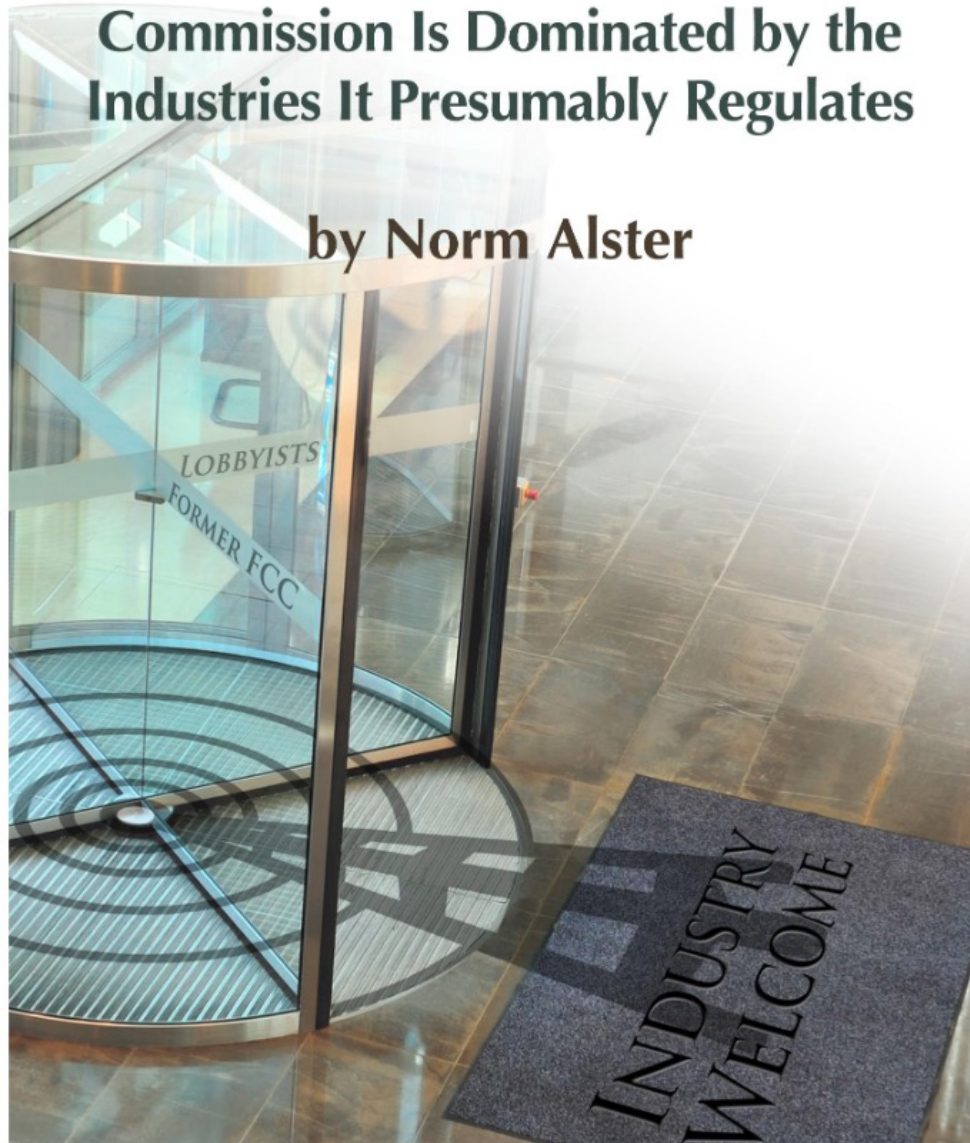
Epidemiology for People Living Near Cell Towers

- Meta study of **38** previous studies: [Evidence for a health risk by RF on humans living around mobile phone base stations: from radiofrequency sickness to cancer](#)
 - 73.6% of studies showed effects of radiofrequency sickness
 - 76.9% of studies showed increased cancer rates
 - 75% of studies showed changes in biochemical parameters
 - Studies also showed negative impacts on animals and trees.
 - A distance of 500 meters from a cell tower appears to be a “reasonable” cutoff distance for adverse health effects.

Captured Agency:

How the Federal Communications Commission Is Dominated by the Industries It Presumably Regulates

by Norm Alster



What Role Do Regulatory Agencies Play?

“Industry controls the FCC through a soup-to-nuts stranglehold that extends from its well-placed campaign spending in Congress through its control of the FCC’s Congressional oversight committees to its persistent agency lobbying.”

https://ethics.harvard.edu/files/center-for-ethics/files/capturedagency_alster.pdf



Conclusions Reached by Commission Majority

[Final Report](#) submitted in November 2020.

- Wireless radiation, which includes 5G, poses a significant threat to human health and the environment
- Electro Hypersensitivity (EHS) is an illness caused by wireless radiation
- This is not solely a scientific issue, it is a political/economic issue
- Until FCC radiation guidelines and policies (the 1996 Telecommunications Act) are changed, protections available to municipalities are limited

Commission Recommendations

(abbreviated)

- Issue a resolution to US Congress to require the FCC to commission an independent health study and review of exposure limits.
- Engage agencies such as the EPA to develop wireless-radiation safety limits that will protect the trees, plants, birds, insects, pollinators and people.
- Require setbacks for new wireless antennas from residences, businesses, and schools (500 meters).
- Establish wireless-radiation free zones in commercial/public buildings.
- Require health agencies to educate on minimizing wireless-radiation exposure with multimedia public service announcements – especially for pregnant women and babies.

COMMENT

Open Access



Scientific evidence invalidates health assumptions underlying the FCC and ICNIRP exposure limit determinations for radiofrequency radiation: implications for 5G

International Commission on the Biological Effects of Electromagnetic Fields (ICBE-EMF)*

Abstract

In the late-1990s, the FCC and ICNIRP adopted radiofrequency radiation (RFR) exposure limits to protect the public and workers from adverse effects of RFR. These limits were based on results from behavioral studies conducted in the 1980s involving 40–60-minute exposures in 5 monkeys and 8 rats, and then applying arbitrary safety factors to an apparent threshold specific absorption rate (SAR) of 4W/kg. The limits were also based on two major assumptions: any biological effects were due to excessive tissue heating and no effects would occur below the putative threshold SAR, as well as twelve assumptions that were not specified by either the FCC or ICNIRP. In this paper, we show how the past 25 years of extensive research on RFR demonstrates that the assumptions underlying the FCC's and ICNIRP's exposure limits are invalid and continue to present a public health harm. Adverse effects observed at exposures below the assumed threshold SAR include non-thermal induction of reactive oxygen species, DNA damage, cardiomyopathy, carcinogenicity, sperm damage, and neurological effects, including electromagnetic hypersensitivity. Also, multiple human studies have found statistically significant associations between RFR exposure and increased brain and thyroid cancer risk. Yet, in 2020, and in light of the body of evidence reviewed in this article, the FCC and ICNIRP reaffirmed the same limits that were established in the 1990s. Consequently, these exposure limits, which are based on false suppositions, do not adequately protect workers, children, hypersensitive individuals, and the general population from short-term or long-term RFR exposures. Thus, urgently needed are health protective exposure limits for humans and the environment. These limits must be based on scientific evidence rather than on erroneous assumptions, especially given the increasing worldwide exposures of people and the environment to RFR, including novel forms of radiation from 5G telecommunications for which there are no adequate health effects studies.

FCC/ICNIRP FALSELY CLAIM

SAR Heating Effect
4 W/kg No Effect Possible

60 mins Acute experiments can predict Chronic effects.

No increase in brain tumors & studies biased

Same Absorption

Same Sensitivity To RFR

Untested YET Safe

UNTESTED

WRONG

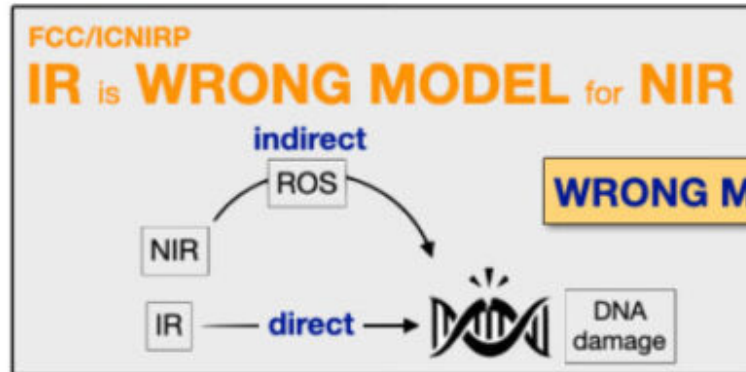
modulation pulsing polarization, frequency

FCC/ICNIRP IGNORE

Synergistic effects with RFR & other environmental agents

Environment at risk

IGNORED



FCC/ICNIRP established

ARBITRARY SAFETY FACTORS

Whole Body

SAR 4W/kg HARMFUL 50-fold safe

SAR 4W/kg HARMFUL 10-fold safe

Localized

10 g tissue 2 W/kg 1 g tissue 1.6 W/kg Safe

10 g tissue 10 W/kg 1 g tissue 8 W/kg Safe

ARBITRARY

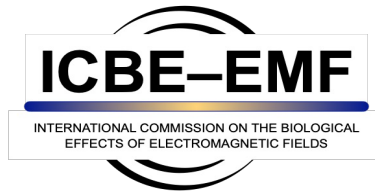
The Recommendations of ICBE-EMF, the EMF Scientist Appeal, and the 5G Appeal Overlap with Those of the New Hampshire Commission

1. Priority should be given to protect children and pregnant women
2. Guidelines and regulatory standards should be biologically based and enforced
3. Manufacturers should be encouraged to develop safer technologies
4. The public should be fully informed about the potential health risks from electromagnetic energy and taught harm reduction strategies
5. Medical professionals need to be educated about the biological effects of electromagnetic energy and be provided training on treatment of patients with electromagnetic sensitivity
6. Governments need to fund training and research on electromagnetic fields and health that is independent of industry
7. The media should disclose experts' financial relationships with industry when citing their opinions regarding health and safety aspects of EMF-emitting technologies
8. Radiation-free areas need to be established, especially for individuals with EHS
9. Moratorium on 5G until it has been found to be safe through independent, unbiased research

Ways to Lower Wireless Radiation Exposure

- Use of wired connections wherever possible
- Site cell towers away from people (NH Commission recommendation)
- Switching to low-emission routers
- Modifications to cellphone and cellphone usage

ICBE-EMF Proposes Solutions for Reducing Cellphone Radiation



International Journal of
*Environmental Research
and Public Health*



an Open Access Journal by MDPI

Cell Phone Radiation Exposure Limits and Engineering Solutions

Paul Héroux; Igor Belyaev; Kent Chamberlin; Suleyman Dasdag; Alvaro Augusto Almeida De Salles; Claudio Enrique Fernandez Rodriguez; Lennart Hardell; Elizabeth Kelley; Kavindra Kumar Kesari; Erica Mallery-Blythe; Ronald L. Melnick; Anthony B. Miller; Joel M. Moskowitz; on behalf of the International Commission on the Biological Effects of Electromagnetic Fields (ICBE-EMF)

Int. J. Environ. Res. Public Health 2023, Volume 20, Issue 7, 5398



Concluding Remarks

- A formal state commission of unbiased experts, formed through bipartisan legislation, concluded that low-level wireless radiation is harmful to human health and the environment.
- Technological developments should be pursued to lessen exposure levels while continuing to provide connectivity.
- We should control exposures to wireless radiation as we try to control exposures to chemicals
- Those in a position to do so are strongly encouraged to enact protections against wireless radiation.