

ICBE-EMF

Chair

John W. Frank, MD
University of Edinburgh
United Kingdom

Vice Chair

Paul Héroux, PhD
McGill University
Canada

Senior Advisor

Ronald L. Melnick, PhD
Former U.S. National
Toxicology Program
USA

Managing Director

Elizabeth Kelley, MA
Electromagnetic Safety
Alliance, Inc.
USA

Commissioners:

David Carpenter MD, MPA
University at Albany,
New York, U.S.A.

Prof. Suleyman Dastdag, PhD
Istanbul Medeniyet University
Turkey

Álvaro de Salles, PhD
Federal University of Rio
Grande do Sul (UFRGS)
Brazil

Claudio Fernández Rodríguez,
M.A. Federal Institute of
Education Science and
Technology of Rio Grande do
Sul (IFRS) Brazil

Joel M. Moskowitz, PhD
University of California,
Berkeley, USA

Igor Yakymenko PhD
Department of Public Health at
Kyiv Medical University
Ukraine

Alasdair Philips, B.Sc., Eng.,
MIEEE
United Kingdom

Submission to Consultation #DGSO-001-26: Consultation on Amendments to the Tower Siting Process and Decision on Roaming, Tower Sharing and Annual Reporting Requirements for Terrestrial Licenses.

The International Commission on the Biological Effects of Electromagnetic Fields (ICBE-EMF) respectfully requests you pause the current public consultation regarding the Innovation, Science and Economic Development Canada (ISED) proposed amendments set out in “Consultation on Amendments to the Tower Siting Process and Decision on Roaming, Tower Sharing and Annual Reporting Requirements for Terrestrial Licenses. We have determined that consultation is inadequate, considering the significant implications of the proposed amendments. Changes of the magnitude proposed in your consultation documents (DGSO-001-26) merit a full, independent public review, such as was done in 2003/2004. We oppose these efforts to fast-track cell towers and are calling for an independent evaluation of the safety of Health Canada’s Safety Code 6 cell tower and wireless radiation exposure limits before the country moves to fast-track cell towers and wireless infrastructure across the nation.

ICBE-EMF is an international consortium of scientists, doctors, and researchers with extensive expertise and peer-reviewed publications on the biological and health effects of non-ionizing electromagnetic fields, including wireless radiation. Wireless radiofrequency (RF) radiation is emitted by wireless devices, including cell phones, cordless phones, Wi-Fi, and Bluetooth-connected electronics, as well as by wireless network equipment such as 5G/4G wireless facilities and cell towers.

The proposal would substantially diminish local and provincial authority regarding the placement of cell towers and wireless facilities. We urge the ISED to withdraw this proposal due to its serious public health and environmental implications, its disregard for established scientific research, and its erosion of democratic, community-based decision-making.

Cell towers, 5G, and wireless infrastructure should not be fast-tracked as this will increase public exposure to RF radiation, an environmental exposure that decades of scientific research have associated with numerous health and environmental harms.¹ Health Canada’s limits on allowable exposures to cell tower and wireless RF radiation have not undergone review since 2015, and do not protect Canadians. Although there are clear financial benefits to wireless carriers in terms of increased profitability, we caution that the proposed changes will come at a serious cost to public health and the environment, as well as strip provincial and local government authorities.

Growing Scientific Evidence Reports Biological and Health Harm from Wireless RF Radiation at Safety Code 6 Compliant Levels of Exposure

A rapidly expanding body of peer-reviewed research demonstrates that RF radiation from wireless infrastructure, including cellular towers and 5G small cell towers, can produce harmful effects at levels far below current Safety Code 6 limits.^{2,3,4,5,6,7}

Special Experts:

Fiorella Belpoggi PhD
Emerita Scientific Director,
Ramazzini Institute, Bologna,
Italy

Kent Chamberlin PhD
Past-Chair, Professor Emeritus
in the Department of Electrical
and Computer Engineering.
University of New Hampshire
USA
*Served on the New Hampshire
State Commission on 5G*

Lennart Hardell MD, PhD
The Environment and Cancer
Research Foundation
Sweden

Martha Herbert, MD, PhD
Pediatric Neurologist,
Neuroscientist
USA

Kavindra Kesari, PhD
Aalto University
Finland

Don Maisch, PhD
Tasmania, Australia

Erica Mallery-Blythe BSBM
Physicians' Health Initiative
for Radiation and
Environment
United Kingdom

Albert M. Manville, II, PhD
Former branch chief, Division
of Migratory Bird
Management, U.S. Fish &
Wildlife Service
Environmental Sciences and
Policy Division
Johns Hopkins University
USA

Theodora Scarato MSW
Environmental Health Sciences
USA

Wenjun Sun, PhD
Zhejiang University's School
of Medicine, Hangzhou
China

The ISED proposal disregards the growing scientific evidence of harm. In our 2022 paper, ICBE-EMF documented the numerous harmful effects observed at wireless RF radiation exposures below the 4 W/kg assumed threshold of harm.

“Many studies have demonstrated oxidative effects associated with exposure to low-intensity RFR, and significant adverse effects including cardiomyopathy, carcinogenicity (brain and thyroid cancer), DNA damage, neurological disorders, increased permeability of the blood-brain barrier, and sperm damage,” explains Dr. Ronald Melnick, ICBE-EMF’s Science Advisor and Past Chair, and a former senior toxicologist with the U.S. National Toxicology Program at the National Institute of Environmental Health Sciences. “These effects need to be addressed in revised and health-protective exposure guidelines. Furthermore, the assumption that 5G millimeter waves are safe because of limited penetration into the body does not dismiss the need for health effects studies”.

The induction of reactive oxygen species (ROS) has been repeatedly documented across numerous peer-reviewed studies, and oxidative stress is known to contribute to a wide range of chronic health conditions, including cancer, neurological disorders, reproductive dysfunction, metabolic disease, and cardiovascular impacts.^{8,9}

Studies of people living near cell towers show increased biomarkers of DNA damage, oxidative stress, hormonal disruption, sleep disturbance, neurological symptoms, and increased cancer rates.^{10,11,12}

Large-scale animal research, including the U.S. National Toxicology Program and Ramazzini Institute studies, both found increased brain and heart tumors.^{13,14,15} Further, the same types of tumors have also been observed in human studies,^{16,17} adding significant confidence that the associations observed in human studies are real.^{18,19}

On April 25, 2025, *Environment International* published a paper entitled [a new systematic review of laboratory animals exposed to radiofrequency radiation](#), partially funded by the World Health Organization, that concluded that these studies and other animal studies provided credible, high certainty evidence linking RF radiation to cancer. The review also found moderate certainty of evidence of an increased risk of rare tumors, such as pheochromocytomas in the adrenal glands and hepatoblastomas in the liver. Additionally, some studies indicated a possible association with lymphomas, although the findings were inconsistent. The findings of this study show that the long-standing assumption that the “current government limits are based on — that cell phone RF radiation can only cause harm through tissue heating — is wrong.” Thus, Safety Code 6 RF limits are not scientifically defensible.

In 2011, the World Health Organization’s International Agency for Research on Cancer (IARC) classified radiofrequency radiation (RF-EMF) as a Group 2B “possibly carcinogenic to humans” based largely on human studies, noting limited animal evidence. This new review concludes “high certainty” animal evidence of cancer causation reinforces calls for IARC to urgently reevaluate RF-EMF for a likely higher cancer classification, for example, from a Group 2B possible carcinogenic to humans to Group 2A probably carcinogenic to humans or Group A carcinogenic to humans.^{20,21}

Canada's RF radiation exposure limits should be based on scientific evidence, *not assumptions*. Most recently, two of our Commissioners, Dr. Ronald L. Melnick and Dr. Joel M. Moskowitz, of the School of Public Health at the University of California, Berkeley, analyzed the data on the increased tumors found in the animal studies of the U.S. National Toxicology Program (NTP) and the Italian Ramazzini Institute (RI)^{22,23} using health risk assessment procedures developed by the U.S. Environmental Protection Agency (EPA). The analysis, published in the journal *Environmental Health*, found that limits need to be reduced by at least 200 times to protect against an excess cancer risk of one per 100,000, the level typically used by the EPA to determine safety limits for environmental hazards.²⁴

The ISDE Plan Would Put Wildlife and Ecosystems at Risk

The ISDE plan to proliferate cell towers would put flora and fauna at risk. Canada has not established guidelines to protect non-human species from RF radiation even though there is a large and growing body of evidence that demonstrates the biological effects of RF radiation on animals and plants.^{25,26,27,28} Expert scientists who published comprehensive reviews of wildlife impacts report that "Numerous studies across all frequencies and taxa indicate that low-level EMF exposures have numerous adverse effects, including orientation, migration, food finding, reproduction, mating, nest and den building, territorial maintenance, defense, vitality, longevity, and survivorship. Cyto- and geno-toxic effects have long been observed. We agree with their recommendation that "it is time to recognize ambient EMF as a novel form of pollution and develop rules at regulatory agencies that designate air as 'habitat' so EMF can be regulated like other pollutants."

Despite claims that such deployments have minimal or no environmental footprint, numerous studies show that siting of cell towers and other wireless facilities can lead to cumulative harms such as habitat disruption, impacts to migratory bird patterns due to light pollution, and adverse effects from ground disturbance activities like trenching and vegetation removal. These foreseeable impacts are critical to understanding the importance of maintaining robust environmental reviews for cell towers and wireless facilities, especially in ecologically sensitive areas.

Allowing for cell tower densification without review of RF radiation exposure or ecological impact would severely limit the local control, timing, and strain the funding and other resources available to municipalities to fully assess the environmental impacts of cell tower and wireless deployment projects.

A Scientific Consensus for Safety Does Not Exist

The [International EMF Scientist Appeal](#), a petition submitted to the United Nations and signed by more than 260 scientists who have published over 2,000 papers on EMF, biology, and health, states that the current wireless RF radiation human exposure guidelines set by the ICNIRP, IEEE, FCC and other national and international organizations are based on avoiding heating effects and do not adequately protect against known health risks that do not involve heat that can cause long-term health risks.^{29,30} The science is far from settled, and numerous medical organizations and public health experts recommend reducing exposure as substantial evidence exists pointing to serious risks.³¹

The American Academy of Pediatrics has called for ³²updating wireless radiation regulations to account for children’s increased vulnerability, noting that the research shows children absorb higher rates of RF radiation deeper into their more sensitive brains, as compared to adults.^{33,34} Further, research has also documented that cell phone radiation exposure can exceed limits when the phone is close to the body,^{35,36} and that Wi-Fi and cell towers can increase children’s exposure in schools.^{37,38} Yet Canada's outdated limits do not account for the combined, real-world exposures from multiple wireless sources, including phones, wearables, Wi-Fi, and nearby cell towers operating simultaneously.

The Cell Tower Radiation Exposure Limits of Safety Code 6 Do Not Protect Public Health or the Environment

The ISED proposals to fast-track wireless tower deployment hinge on the assumption that Canada’s existing cell tower RF radiation exposure regulations are sound. However, Canada’s Safety Code 6 RF limits fail to provide adequate protection for public health or the environment. The outdated limits, without review since 2015, are based on scientifically unsupported assumptions, as they are only based on addressing short-term heating effects while ignoring the extensive peer-reviewed published scientific evidence of biological harm at lower, non-heating levels. Safety Code 6 states its limits are based on the whole-body average SAR of ~4 W/kg derived from short-term behavioral disruption studies in animals as “the only established adverse health effects associated with RF field exposures in the frequency range from 3 kHz to 300 GHz relate to the occurrence of tissue heating and nerve stimulation (NS) from short-term (acute) exposures”.³⁹ These limits do not account for chronic long-term exposure or the pulse-modulated signals transmitted by wireless technologies. Canada’s limits have not been updated in a decade based upon a comprehensive review of the current scientific evidence on cellular, neurological, reproductive, or carcinogenic effects.^{40,41}

Safety Code 6 limits do not account for long-term health effects, children's vulnerability, cumulative exposures, electromagnetic hypersensitivity, or the documented impacts on wildlife and ecosystems.

As documented by ICBE-EMF, in our paper published in *Environmental Health* entitled “[Scientific evidence invalidates health assumptions underlying the FCC and ICNIRP exposure limit determinations for radiofrequency radiation: implications for 5G](#),” RF exposure guidelines based on the 4 W/kg SAR such as the IEEE, ICNIRP, U.S. FCC and Safety Code 6 ignore decades of peer-reviewed research showing biological harm at levels far below those that cause heating. Our paper detailed the scientific evidence and erroneous assumptions that underpin these exposure limits for wireless RF radiation, as detailed in the graphic below. Thus, Safety Code 6 limits do not adequately protect workers, children, people with electromagnetic hypersensitivity, and the public from cell tower radiation.

Erroneous Assumptions Underlying the Safety Code 6, IEEE, FCC and ICNIRP Exposure Limits for RF Radiation	
<u>A) Effects of RE radiation at exposures below the putative SAR threshold of 4 W/kg.</u> Assumption 1 There is an exposure threshold for any adverse health effect caused by RF radiation; in the frequency range of 100 kHz to 6 GHz it is a	<u>D) Individual variations in exposure and sensitivity to RF-EMF</u> Assumption 7 There are no differences among individuals, including children, in the absorption of RF-EMF and susceptibility to this radiation.

whole-body exposure that exceeds an SAR of 4 W/kg. Any biological effect of radiation above the threshold exposure is due to tissue heating. Assumption 2 The RF radiation is incapable of causing DNA damage other than by heating; there is no mechanism for non-thermal DNA damage. Assumption 3 Two to seven exposures to RF radiation for up to one hour are sufficient to exclude adverse effects of RF radiation for any duration of exposure, including chronic exposure. Assumption 4. No additional effects would occur from RF radiation with co-exposure to other environmental agents <u>B) Factors influencing dosimetry</u> Assumption 5 Health effects are dependent only on the SAR value; carrier wave modulations, frequency, or pulsing do not matter except as they influence the SAR. C) Human brain cancer risk Assumption 6 The multiple human studies that find associations between exposure to cell phone RF radiation and increases in brain cancer risk are flawed because of biases in the published case-control studies, and because brain cancer rates have remained steady since the use of wireless communication devices became widespread.	Assumption 8 There are no differences among individuals in their sensitivity to this RF radiation-induced health effects. <u>E) Applied safety factors for EMF-RF workers and the general population</u> Assumption 9 A 50-fold safety factor for the whole-body exposure to RF radiation is adequate for protecting the general population from any health risk from RF radiation. Assumption 10 A 10-fold safety factor for whole body exposure to RF radiation is adequate for protecting workers from any health risk from RF radiation. Assumption 11 Exposure of any gram of cube-shaped tissue up to 1.6 W/kg, or 10 grams of cube-shaped tissue up to 10 W/kg, (duration not specified) will not increase the risk of that tissue to any toxic or carcinogenic effects in the general population. Assumption 12 Exposure of any gram of cube-shaped tissue up to 8 W/kg, or 10 grams of cubed-shaped tissue, (duration not specified) will not increase the risk that tissue to any toxic or carcinogenic effects in workers. F) Environmental exposure to RF radiation Assumption 13 There is no concern for environmental effects of RF radiation or the effects on wildlife or household pets. G) 5G (5th generation wireless) Assumption 14 No health effects data are needed for exposures to 5G: safety is assumed because penetration is limited to the skin ("minimal body penetration").
---	---

Our Science-Based Conclusion: Canada Should Not Fast Track Cell Tower Deployment

While these proposals are being promoted to alleviate unnecessary burdens created by provincial and local rules over the telecommunications industry, the burden would certainly shift to the Canadian people. The public and the environment will carry the costs from this inadequately regulated environmental exposure. The ISDE proposal effectively treats Canadian communities as test subjects in an uncontrolled national radiation experiment, one conducted without consent, without monitoring, and without updated safety limits. If the country proceeds to fast-track cell towers without revising its outdated 2015 Safety Code 6 RF radiation exposure limits, it will knowingly promote densification of industrial wireless transmitters and expose millions to cell tower RF radiation levels that multiple peer-reviewed studies associate with increased cancer risk, neurological, and reproductive harm.

The ISDE should withdraw and re-issue cell tower proposals only after a comprehensive environmental and health review is completed.

Further questions or concerns may be sent to us at info@icbe-emf.org.

Respectfully Submitted,

John Frank, M.D.
Chairperson, ICBE-EMF

Ronald L. Melnick, Ph.D.
Past President, currently Senior Advisor, ICBE-EMF

Elizabeth Kelley, M.A.
Managing Director, ICBE-EMF

¹ Joel M. Moskowitz, *Effects of Exposure to Electromagnetic Fields: Thirty Years of Research*, Science Blog (Feb. 2018) <https://www.saferemr.com/2018/02/effects-of-exposure-to-electromagnetic.html>

² Lai H, Levitt BB. Cellular and molecular effects of non-ionizing electromagnetic fields. *Rev Environ Health* (2024) 39:519–529. doi: <https://doi.org/10.1515/reveh-2023-0023>

³ Lin JC. Health and safety practices and policies concerning human exposure to RF/microwave radiation. *Front Public Health* (2025) 13: doi: 10.3389/fpubh.2025.1619781

⁴ Lai H, Levitt BB. [Radiofrequency radiation-induced gene expression](https://doi.org/10.1515/reveh-2025-0104). *Rev Environ Health*. 2025 Oct 29. doi: [10.1515/reveh-2025-0104](https://doi.org/10.1515/reveh-2025-0104).

⁵ Henshaw DL, Philips A. A mechanistic understanding of human magnetoreception validates the phenomenon of electromagnetic hypersensitivity (EHS). *Int J Radiat Biol* (2025) 101:186–204. doi: [10.1080/09553002.2024.2435329](https://doi.org/10.1080/09553002.2024.2435329)

-
- ⁶ McCredden JE, Cook N, Weller S, Leach V. Wireless technology is an environmental stressor requiring new understanding and approaches in health care. *Front Public Health* (2022) 10: [doi: 10.3389/fpubh.2022.986315](https://doi.org/10.3389/fpubh.2022.986315)
- ⁷ Davis D, Birnbaum L, Ben-Ishai P, Taylor H, Sears M, Butler T, Scarato T. Wireless technologies, non-ionizing electromagnetic fields and children: Identifying and reducing health risks. *Curr Probl Pediatr Adolesc Health Care* (2023) 53:101374. [doi: 10.1016/j.cppeds.2023.101374](https://doi.org/10.1016/j.cppeds.2023.101374)
- ⁸ Schuermann D, Mevissen M. Manmade Electromagnetic Fields and Oxidative Stress—Biological Effects and Consequences for Health. *Int J Mol Sci* (2021) 22:3772. [doi: 10.3390/ijms22073772](https://doi.org/10.3390/ijms22073772)
- ⁹ Yakymenko I, Tsybulin O, Sidorik E, Henshel D, Kyrylenko O, Kyrylenko S. (2016). [Oxidative mechanisms of biological activity of low-intensity radiofrequency radiation](https://doi.org/10.3109/15368378.2015.1043557). *Electromagn BiolMed*, 35(2), 186–202. <https://www.tandfonline.com/doi/full/10.3109/15368378.2015.1043557>
- ¹⁰ Balmori A. Evidence for a health risk by RF on humans living around mobile phone base stations: From radiofrequency sickness to cancer. *Environ Res* (2022) 214:113851. [doi: 10.1016/j.envres.2022.113851](https://doi.org/10.1016/j.envres.2022.113851)
- ¹¹ Hardell L, Nilsson M. Summary of seven Swedish case reports on the microwave syndrome associated with 5G radiofrequency radiation. *Rev Environ Health* (2025) 40:147–157. [doi: 10.1515/reveh-2024-0017](https://doi.org/10.1515/reveh-2024-0017)
- ¹² Sailo, L, Laldinpuii, Zosangzuali M, Weller S, Varte CL, Tochwawng L, ... Zothansiamia. (2025). Greater prevalence of symptoms associated with higher exposures to mobile phone base stations in a hilly, densely populated city in Mizoram, India. *Electromagn BiolMed*, 44(4), 385–404.[doi: 10.1080/15368378.2025.2513900](https://doi.org/10.1080/15368378.2025.2513900)
- ¹³ Lin JC. Carcinogenesis from chronic exposure to radio-frequency radiation. *Front Public Health* (2022) 10:1042478. [doi: 10.3389/fpubh.2022.1042478](https://doi.org/10.3389/fpubh.2022.1042478)
- ¹⁴ Melnick RL. Commentary on the utility of the National Toxicology Program study on cell phone radiofrequency radiation data for assessing human health risks despite unfounded criticisms aimed at minimizing the findings of adverse health effects. *Environ Res* (2019) 168:1–6. [doi: 10.1016/j.envres.2018.09.010](https://doi.org/10.1016/j.envres.2018.09.010)
- ¹⁵ Falcioni, L., Bua, L., Tibaldi, E., Lauriola, M., De Angelis, L., Gnudi, F., Mandrioli, D., Manservigi, M., Manservigi, F., Manzoli, I., Menghetti, I., Montella, R., Panzacchi, S., Sgargi, D., Strollo, V., Vornoli, A., & Belpoggi, F. (2018). [Report of final results regarding brain and heart tumors in Sprague-Dawley rats exposed from prenatal life until natural death to mobile phone radiofrequency field representative of a 1.8 GHz GSM base station environmental emission](https://doi.org/10.1016/j.envres.2018.09.010). *Environ Res*, 165, 496–503.

-
- ¹⁶ Moon J, Kwon J, Mun Y. 2024. "Relationship between radiofrequency-electromagnetic radiation from cellular phones and brain tumor: meta-analyses using various proxies for RF-EMR exposure-outcome assessment. *Environ Health* 23, 82. <https://doi.org/10.1186/s12940-024-01117-8>
- ¹⁷ Choi, Y-J, Moskowitz JM, Myung S=K, Lee Y-R, Hong Y-C. 2020. "Cellular Phone Use and Risk of Tumors: Systematic Review and Meta-Analysis" *Int J Environ Res Public Health* 17, no. 21: 8079. doi: [10.3390/ijerph17218079](https://doi.org/10.3390/ijerph17218079)
- ¹⁸ Hardell L, & Carlberg M. (2019). Comments on the US National Toxicology Program technical reports on toxicology and carcinogenesis study in rats exposed to whole-body radiofrequency radiation at 900 MHz and in mice exposed to whole-body radiofrequency radiation at 1,900 MHz. *IntJ Oncology*, 54(1), 111–127. <https://doi.org/10.3892/ijo.2018.4606>
- ¹⁹ Prasad M, Kathuria P, Nair P, Kumar A, Prasad K. 2017. "Mobile phone use and risk of brain tumours: a systematic review of association between study quality, source of funding, and research outcomes." *Neurol Sci*.doi: [10.1007/s10072-017-2850-8](https://doi.org/10.1007/s10072-017-2850-8)
- ²⁰ Miller AB, Morgan LL, Udasin I, Davis DL. Cancer epidemiology update, following the 2011 IARC evaluation of radiofrequency electromagnetic fields (Monograph 102). *Environ Res* (2018) 167:673–683. doi: [10.1016/j.envres.2018.06.043](https://doi.org/10.1016/j.envres.2018.06.043)
- ²¹ Hardell L, Carlberg M. Comments on the US National Toxicology Program technical reports on toxicology and carcinogenesis study in rats exposed to whole-body radiofrequency radiation at 900 MHz and in mice exposed to whole-body radiofrequency radiation at 1,900 MHz. *Int J Oncol* (2018) doi: [10.3892/ijo.2018.4606](https://doi.org/10.3892/ijo.2018.4606)
- ²² Lin JC. Carcinogenesis from chronic exposure to radio-frequency radiation. *Front Public Health* (2022) 10:1042478. doi: [10.3389/fpubh.2022.1042478](https://doi.org/10.3389/fpubh.2022.1042478)
- ²³ Melnick RL. Commentary on the utility of the National Toxicology Program study on cell phone radiofrequency radiation data for assessing human health risks despite unfounded criticisms aimed at minimizing the findings of adverse health effects. *Environ Res* (2019) 168:1–6. doi: [10.1016/j.envres.2018.09.010](https://doi.org/10.1016/j.envres.2018.09.010)
- ²⁴ Melnick, R.L., Moskowitz, J.M. on behalf of The International Commission on the Biological Effects of Electromagnetic Fields (ICBE-EMF). Exposure limits to radiofrequency EMF do not account for cancer risk or reproductive toxicity assessed from data in experimental animals. *Environ Health* (2026). <https://doi.org/10.1186/s12940-026-01288-6>

-
- ²⁵ Levitt BB, Lai HC, Manville AM. Effects of non-ionizing electromagnetic fields on flora and fauna, part 1. Rising ambient EMF levels in the environment. *Rev Environ Health*. 2021 May 27;37(1):81-122. doi: [10.1515/reveh-2021-0026](https://doi.org/10.1515/reveh-2021-0026).
- ²⁶ Levitt BB, Lai HC, Manville AM. Effects of non-ionizing electromagnetic fields on flora and fauna, Part 2 impacts: how species interact with natural and man-made EMF. *Rev Environ Health*. 2021 Jul 8;37(3):327-406. doi: [10.1515/reveh-2021-0050](https://doi.org/10.1515/reveh-2021-0050).
- ²⁷ Levitt BB, Lai HC, Manville AM. Effects of non-ionizing electromagnetic fields on flora and fauna, Part 3. Exposure standards, public policy, laws, and future directions. *Rev Environ Health*. 2021 Sep 27;37(4):531-558. doi:[10.1515/reveh-2021-0083](https://doi.org/10.1515/reveh-2021-0083).
- ²⁸ Levitt BB, Lai HC, Manville AM. Low-level EMF effects on wildlife and plants: What research tells us about an ecosystem approach. *Front Public Health* (2022) 10: doi: [10.3389/fpubh.2022.1000840](https://doi.org/10.3389/fpubh.2022.1000840)
- ²⁹ EMF Scientist International Appeal. 4G/5G antenna densification is escalating health risks – a global crisis [Internet]. New York, NY: EMFscientist.org; 22 Jul 2019 [cited 2025 Oct 29]. Available from: <https://emfscientist.org/>
- ³⁰ Kelley E, Blank M, Lai H, Havas M, Moskowitz J. International Appeal: Scientists call for protection from non-ionizing electromagnetic field exposure. *European J Oncol*. 2015;20(3/4):180-182. Available from: <https://www.mattioli1885journals.com/index.php/EJOEH/article/view/4971>
- ³¹ Environmental Health Sciences. *Doctors and scientists on cell phone radiation health effects* EHSciences.org; 2025. Available from: <https://ehsciences.org/doctors-and-scientists-on-cell-phone-radiation-health-effects/>
- ³² American Academy of Pediatrics. Letter in Support of the Cell Phone Right to Know to The Honorable Dennis Kucinich. (2012). Letter to the FCC Honorable Mignon L. Clyburn and FDA Honorable Dr. Margaret A. Hamburg Commissioner (2013); Letter to the FCC Honorable Julius Genachowski (2012) Available online at: <https://icbe-emf.org/wp-content/uploads/2025/01/American-Academy-of-Pediatrics-Letters-to-FCC-and-Congress-on-cell-phone-radiation-health-effects-.pdf>
- ³³ Fernández C, de Salles, AA., Sears M. E., Morris RD, & Davis D L Absorption of wireless radiation in the child versus adult brain and eye from cell phone conversation or virtual reality. *Environmental Research* (2018) 167, 694–699 <https://doi.org/10.1016/j.envres.2018.05.013>
- ³⁴ Mohammed B, Jin J, Abbosh AM, Bialkowski KS, Manoufali M and Crozier S, "Evaluation of Children's Exposure to Electromagnetic Fields of Mobile Phones Using Age-Specific Head Models with

Age-Dependent Dielectric Properties," *IEEE Access* (2017) vol. 5, pp. 27345-27353, 2017, [doi: 10.1109/ACCESS.2017.2767074](https://doi.org/10.1109/ACCESS.2017.2767074)

³⁵ Gandhi, O. P. (2019). [Microwave Emissions from Cell Phones Exceed Safety Limits in Europe and the US When Touching the Body](https://doi.org/10.1109/ACCESS.2019.2906017). *IEEE Access*, 7, 47050–47052. <https://ieeexplore.ieee.org/document/8688629https://doi.org/10.1109/ACCESS.2019.2906017>

³⁶ Scarato T. U.S. policy on wireless technologies and public health protection: regulatory gaps and proposed reforms. *Front Public Health* (2025) In press.

³⁷ Soares NE, Bulla G, Fernández-Rodríguez CE, de Salles AA. “SAR Estimations in a Classroom with Wireless Computers” *Journal of Microwaves, Optoelectronics and Electromagnetic Applications* (2025) Vol. 24, No. 2, e2025288526 DOI: <http://dx.doi.org/10.1590/2179-10742025v24i3288526>

³⁸ Bhatt CR, Redmayne M., Billah B., Abramson MJ., & Benke, G. Radiofrequency-electromagnetic field exposures in kindergarten children. *Journal of Exposure Science & Environmental Epidemiology* (2017) 27(5), 497–504. <https://doi.org/10.1038/jes.2016.55>

³⁹Health Canada. (2015). *Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz: Safety Code 6*. Consumer and Clinical Radiation Protection Bureau, Environmental and Radiation Health Sciences Directorate, Healthy Environments and Consumer Safety Branch, Health Canada. Ottawa, Ontario, Canada. <https://www.canada.ca/en/health-canada/services/publications/health-risks-safety/limits-human-exposure-radiofrequency-electromagnetic-energy-range-3-300.html>

⁴⁰ International Commission on the Biological Effects of Electromagnetic Fields (ICBE-EMF), Belyaev I, Blackman C, Chamberlin K, DeSalles A, Dasdag S, Fernández C, Hardell L, Héroux P, Kelley E, et al. Scientific evidence invalidates health assumptions underlying the FCC and ICNIRP exposure limit determinations for radiofrequency radiation: implications for 5G. *Environ Health* (2022) 21: [doi: 10.1186/s12940-022-00900-9](https://doi.org/10.1186/s12940-022-00900-9)

⁴¹ Lai H, Levitt BB. The roles of intensity, exposure duration, and modulation on the biological effects of radiofrequency radiation and exposure guidelines. *Electromagn Biol Med* (2022) 41:230–255. doi: [10.1080/15368378.2022.2065683](https://doi.org/10.1080/15368378.2022.2065683)