



**4th EHT International Expert Forum
on the Public Health and
Environmental Impacts of
Cellular and Wireless Radiation Exposure 2024**

Yale University Medical School,
Department of Obstetrics,
Gynecology, and Reproductive Sciences

June 4-6, 2024

PREFACE

Environmental Health Trust is honored and privileged to welcome you to this Expert Forum on Electromagnetic Fields and Health being held at the Department of Obstetrics, Gynecology, and Reproductive Sciences at the School of Medicine and chief of Obstetrics and Gynecology at Yale-New Haven Hospital. The purpose of this meeting is to present, discuss, and evaluate major data gaps in research on non-thermal effects from the exposure to non-ionizing radiation at levels currently allowed and propose priorities for future studies. This meeting builds upon prior Expert Forums convened by Environmental Health Trust in [2009](#) with support from the National Institute for Environmental Health Sciences, the Israel Institute for Advanced Study, private foundations and the Universities of Ariel and Tel Aviv in 2017 in Jerusalem and in 2020 in Tel Aviv. With support from members of the Board of Directors of EHT, the Klungness Foundation, the Carroll Petrie Foundation, and anonymous donors, the 2024 meeting will focus on evaluating and discussing the latest science as it relates to modeling, measuring exposures and their impacts on developing organisms, including children, wildlife and the general environment. A highlight of the meeting will be the convergence of science and industry experts to identify and discuss the public health and environmental risk implications of our modern wireless society and policy options to curtail adverse impacts underway in the State of Connecticut, internationally and elsewhere. Videos of the meeting will be produced and will be made available only after speakers have authorized their release to the public.

Devra Davis, PhD MPH, outgoing President of EHT

Kent Chamberlin PhD, incoming President of EHT

SCHEDULE OF PRESENTATIONS

DAY 1: June 4, 2024

9:30-10:00	Opening Plenary, Devra Davis
10:00-11:15	Plenary Session: Understanding Wireless Radiation and Health, Chaired by Kent Chamberlin
10:00-10:25	James Lin - A Paradigm Shift? Health and Safety of Human Exposure to RF Radiation
10:30-10:55	Henry Lai - Mechanisms of Biological Effects of Non-Ionizing Electromagnetic Fields
10:55-11:15	Discussion
BREAK	
11:30-13:10	Session 1 – Public Health (Epidemiology), Chaired by Elizabeth Kelly
11:30-12:00	John Frank - Epidemiological Issues in the Assessment of RF-EMF Health Effects
12:00-12:25	Kent Chamberlin - New Hampshire 5G Commission
12:25-12:50	Steven Weller - Mobile Phone Radiofrequency Exposure- A Risk Factor for Thyroid Cancer?
12:50-13:10	Discussion
LUNCH BREAK	
14:30-16:30	Session 2 – Electrical Engineering (Simulation & Dosimetry), Chaired By Rob Brown
14:30-14:55	Paul Ben-Ishai - A Pictorial Introduction to Wave Theory
14:55-15:20	Noa Betzalel - The Modeling of the Electromagnetic Interaction of 5G/6G Pulsed-Signal Radiation and Human Skin

15:20-15:45	Kent Chamberlin - Conditions Necessary for Demodulation in Biological Tissues
16:10-16:30	Discussion
BREAK	
16:45-18:30	Session 3 – Public Health (Toxicology), Chaired by Carolina Zilli Vieira
16:45-17:05	Joel Moskowitz - Problems with the COSMOS Cell Phone Radiation Exposure and Brain Tumor Risk Study
17:05-17:25	Paul Héroux - The Collision Between Wireless and Biology
17:25- 17:45	Ron Melnick - Science, Policy, and Exposure Limits to Radiofrequency Radiation (RFR)
17:4 -18:10	Rob Brown - Case Report: Thyroid Papillary Carcinoma Caused by Long-Term Mobile Phone Use?
18:10-18:30	Discussion

EVENING RECEPTION

DAY 2: June 5, 2024

08:50-11:10	Session 1 – Biophysics (Physical mechanisms), Chaired by Paul Ben Ishai
08:50 - 09:15	Frank Barnes - Dielectric Constants
09:15-09:40	Dimitris Panagopoulos - Wireless Communication Electromagnetic Fields: Biological and Health Effects. Biophysical Mechanism of Action
09:40-10:05	Igal Bilik - Exposure System for Electromagnetic Fields Interaction with Circulating Red Blood Cells
10:05-10:25	Suleyman Kaplan and Devra Davis - Prenatal Exposure to Electromagnetic Field and Therapeutic Value of

Melatonin and Omega-3 on the Obesity-Related Hypothalamic Nucleus

10:25-10:45 Arife Kaplan - An In Vitro Study of the Impact of 900 MHz Radiation on Human Sperm: A Clinical and Molecular Approach

10:45-11:10 Igor Belyaev - Genomic Impacts of Environmental Exposures to EMF

BREAK

11:30-13:20 Session 2 - Public Health, Chaired by Devra Davis

11:30-11:55 Hugh Taylor - Prenatal Studies on Behavior & EMF

11:55-12:20 Stella Canna Michaelidou - The Misuse of Digital Devices and Emitted EMF/RF: Two Sides of a Highly Risky Coin-Cyprus Holistic Approach to Raise Awareness, Influence Policies, and Reduce Risks in Homes, Schools, and Hospitals

12:20-12:40 Dariusz Leszczynski - Individual Sensitivity to EMF: Why We Need Proteomics Research

12:40-12:55 Rusty Turner - Remarks on Neurological Impacts and Implications for Pediatric Health

12:55-13:20 Erica Mallery-Blythe - Investigating Electromagnetic Hypersensitivity: A Focus on Human Experimental Studies

LUNCH BREAK

15:00-16:30 Session 3 – EMF Impacts to Flora and Fauna, Chaired by Theodora Scarato

15:00-15:25 Blake Levitt and Henry Lai - EMF Effects to Wildlife at Ecosystem Levels

15:25-15:50 Aaron Pilarcik - The Effects of Man-Made Electromagnetic Fields on Plant Health, Growth, and Metabolism

15:50-16:15 Carolina Zilli Vieira - Biological Responses of Visual and Non-Visual Opsins Under Exposition to Different Electromagnetic Radiation Energy

16:15-16:40 Albert Manville - Steps Needed to Address Deficiencies with Radiation Impacts to Wildlife

BREAK

17:00-18:30 Session 4 – Regulatory Accountability: Environment, Oversight, Enforcement, and Transparency, Chaired by Devra Davis

17:00-17:25 Theodora Scarato - U.S. Regulation of Wireless: A Case Study in Regulatory Gaps, Recommendations for Improving Regulatory Accountability and Transparency

17:25-17:50 Joe Sandri - The Enforcement Paradox

17:50-18:30 Discussion

END OF DAY

DAY 3: June 6, 2024

09:00-11:00 Session 1 – Discussion Groups
Participants will split into groups of 3 plus a moderator. Exposure assessment; public health Each group is to be given a specific discussion topic and task. Each group is to prepare a list of major data gaps and research priorities.

11:00–11:30 Closing Statements (Kent Chamberlin and Devra Davis)

12:00-14:00 Luncheon and Workgroup Presentations (Barcelona Restaurant)

DISCUSSION GROUPS

GROUP 1: SAR Revise or Replace? *Rapporteur Kent Chamberlin*

The appropriate measure for devising public health standards remains a matter of considerable debate and controversy. For the past four decades, the assumption that has guided regulatory approaches is that the sole effect to be avoided from EMF is heating. Current science clearly establishes that there is a range of nonthermal effects. How best to develop appropriate regulatory limits for exposure that take this into account?

Participants: Kent Chamberlin, Paul Ben-Ishai, Ron Melnick, Aaron Pilarcik

GROUP 2: Opportunistic Public Health Studies? *Rapporteur John Frank*

Cross-sectional studies the possibility of elucidating impacts of exposures to EMF, providing that appropriate questionnaires can be devised that acquire valid information on typical exposures that include personal devices as well as ground current, dirty electricity, etc.

Collaboration with oncologists will be key to understanding the potential role of EMF in the induction of thyroid cancer, leukemias, breast cancer gliomas, and atypical osteosarcomas. Producing clear and compelling information for specific medical specialities constitutes a first step in securing this collaboration

Time-trends rarely pinpoint causes but can provide signals regarding important environmental changes, i.e., tobacco smoking and lung cancer. Questions should be raised about the role of EMFs in autism, ADHD, and other psycho-behavioral anomalies.

Participants: John Frank, Rob Brown, Steve Weller, Hugh Taylor, Dariusz Leszczynski

GROUP 3: Policy Options, Local and State *Rapporteur Theodora Scarato*

Despite legal authority, U.S. federal agencies lack funding and personnel to implement existing laws. In contrast to France and several other nations, in the U.S. there is no federal program monitoring or mapping EMF, no auditing of compliance reports, minimal premarket safety testing and no post market health and environmental surveillance programs. Many reports have found that cell phones and rooftop antennas can exceed the FCCs outdated guidelines developed in 1996. Promoting competition on safety among providers offers the potential to generate lower exposures for

individual users as well as wildlife. In *EHT et al v. FCC*, 2021, the court instructed the FCC to assess and evaluate potential impacts on the natural environment as well as impacts on the young.

What federal (and/or state and local) policies are recommended to promote regulatory accountability towards ensuring protection for humans, wildlife and the environment? What personnel, training and funding are required?

Participants: Theodora Scarato, B. Blake Levitt, Elizabeth Kelly, Paul Heroux, Carolina Zilli Vieira, Joe Sandri

EXPERT FORUM PARTICIPANTS

Prof. Frank Barnes, University of Colorado, Boulder

Prof. Igor Belyaev, Biomedical Research Center

Prof. Paul Ben-Ishai, Ariel University

Prof. Noa Betzalel, The Hebrew University of Jerusalem

Prof. Igal Bilik, Ben Gurion University of the Negev

Dr. Robert R. Brown, Radiology Partners Ltd, UPMC- Hamot, Environmental Health Trust

Prof. Kent Chamberlin, University of New Hampshire, Environmental Health Trust

Dr. Devra Davis, Environmental Health Trust

Prof. John Frank, University of Edinburgh

Prof. Paul Héroux, McGill University

Ms. Arife Kaplan, Istanbul Medipol University

Prof. Suleyman Kaplan, Ondokuz Mayıs University

Ms. Elizabeth Kelley, International Commission on the Biological Effects of Electromagnetic Fields

Prof. Henry Lai, University of Washington

Dr. Dariusz Leszczynski, Frontiers Media

Ms. B. Blake Levitt, National Association of Science Writers

Prof. James Lin, University of Illinois

Dr. Erica Mallery-Blythe, Physicians' Health Initiative for Radiation and Environment

Dr. Albert Manville, Certified Wildlife Biologist

Dr. Stella Canna Michaelidou, The Cyprus National Committee on Environment and Children's Health

Dr. Ron Melnick, U.S. National Toxicology Program, NIEHS (retired); Chair, International Commission on the Biological Effects of Electromagnetic Fields

Dr. Joel Moskowitz, University of California, Berkeley; International Commission on the Biological Effects of Electromagnetic Fields

Prof. Dimitris Panagopoulos, University of Athens

Dr. Aaron Pilarcik, Massachusetts Institute of Technology

Mr. Joe Sandri, Environmental Health Trust and National Spectrum Management Association

Ms. Theodora Scarato, Environmental Health Trust

Dr. Hugh Taylor, Yale University

Dr. Robert "Rusty" Turner, Medical University of South Carolina

Dr. Carolina Zilli Vieira, Harvard University

Mr. Steven Weller, Griffith University

OPENING REMARKS: EPISTEMOLOGICAL FOUNDATIONS OF TOXICOLOGY AND EPIDEMIOLOGY

Devra Davis, PhD, MPH
Environmental Health Trust

Abstract

There are fundamental differences in information provided by experimental studies of toxicology and the observational studies of epidemiology. These are especially evident when evaluating electromagnetic fields and their impact on public health and the environment. In vitro and in vivo studies with animals or human cell cultures are designed to predict impacts in humans as a means of developing approaches to prevent negative effects from occurring and also form the basis for the generation of electronic and other therapeutic applications in medicine. In contrast, epidemiologic studies of relevance to bioelectromagnetics can only reflect the impact of the past and can never be used to predict future consequences. The conference is organized to allow the identification of major data gaps and priorities in relevant fields. This opening presentation will outline the responsibilities of the work groups and confirm that this is an expert meeting where findings will not be shared until and unless those presenting them have approved that.

A PARADIGM SHIFT? HEALTH AND SAFETY OF HUMAN EXPOSURE TO RF RADIATION

James C. Lin

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Abstract

The U.S. military-industrial complex played a huge role in influencing research on the biological effects from exposure to electromagnetic fields and waves including RF radiation since the inception of scientific investigation in the middle of the last century. For most of that period, their emphasis was directed toward tissue heating by RF radiation due to body temperature elevations. They have rigorously defended against and highly critical of research reports that suggest otherwise. The RadioBio initiative in the role electromagnetic signaling may have in biological systems appears to suggest a paradigm shift in the U.S. military's standard of operation procedure. It is in distinct contrast to the recently announced termination of NTP's RF effects research program on how RF radiation causes cancer, which practically halts most, if not all biological research of RF radiation supported by the civilian U.S. government. The rapid proliferation of cellular mobile telecommunication devices and systems is raising public health concerns about the health effects and safety of RF radiation exposure. Furthermore, the efficacy of promulgated health safety limits, rules, and recommendations for RF radiation used by these devices and systems are questionable. DARPA's historical and contemporary contributions to the scientific and technological advancements are widely known. Thus, it begs the question: what does DARPA know the civilian side would rather not be bothered with? Could it be a mundane case of the civilian U.S. government agencies (including the elected representatives) yielding to industrial pressures or demands?

MECHANISMS OF BIOLOGICAL EFFECTS OF NON-IONIZING ELECTROMAGNETIC FIELDS

Henry Lai¹ and B. Blake Levitt²

¹Department of Bioengineering, University of Washington, Seattle, WA, USA

²National Association of Science Writers, Berkeley, CA, USA

Abstract

The way that living cells respond to non-ionizing electromagnetic fields (EMF), including static/extremely-low frequency and radiofrequency electromagnetic fields, fits the pattern of 'cellular stress response' – a set pattern of cellular and molecular responses to environmental stressors. It is triggered by cellular macromolecular damage (in proteins, lipids, and DNA) with the goal of repairing and returning cell functions to homeostasis. This response could be triggered by EMF-induced alternation in oxidative processes in cells, which are the most consistently observed effects of EMF exposure. The concept that biological response to EMF is a 'cellular stress response' explains many observed effects of EMF, such as nonlinear dose- and time-dependency, increased and decreased risks of cancer and neurodegenerative diseases, enhanced nerve regeneration, and bone healing. A corollary to electromagnetic hypersensitivity syndrome (EHS) could be an inappropriate response of the hippocampus/limbic system to EMF, involving glucocorticoids on the hypothalamic-pituitary-adrenal axis. This could have originated from a primordial characteristic of evolution, i.e., the ability to sense intensity, orientation, and direction of geomagnetic fields in the environment, which play important roles in the survival of all living species.

EPIDEMIOLOGICAL ISSUES IN ASSESSING THE EVIDENCE ON HUMAN HEALTH HARMS FROM RF-EMF EXPOSURE

John W. Frank MD, CCFP, MSc, FRCPC, FCAHS, FFPH, FRSE, LLD
University of Edinburgh; Professor Emeritus, University of Toronto

Abstract

Purpose: To review the striking but worrisome epidemiological features of the existing human observational studies of RF-EMF exposure and adverse health effects, using the literature on cellphones and brain tumours as a worked example.

Methods: Critical narrative review of relevant published primary studies, systematic reviews, and meta-analyses, with a deeper analysis of cancer latency and its treatment in these studies.

Results: Several epidemiological literatures encompass observational human epidemiological studies of diverse adverse health effects' associations with RF-EMF exposures. Of these, studies about wireless/cell phone exposure and brain tumours are perhaps the most numerous, longstanding, and contentious. Existing systematic reviews and meta-analyses of this literature clearly demonstrate remarkable study heterogeneity across the primary studies, in both study designs and – statistically speaking – results. Possible reasons for this heterogeneity are reviewed, including: inadequate and potentially biased exposure assessment; downward secular trends in study participation rates, leading to potentially biased population “norms” for cell-phone use; inadequate statistical power, related to the low incidence of most types of brain tumours and – increasingly – ever-declining sub-populations of non-exposed persons; the use of strongly correlated measures of exposure intensity, duration and age-at-exposure-onset; inadequate treatment of latency, leading to high risk of false-negative early studies; and under-declared potential conflicts of interest among investigators, typically related to commercial sources of research funding. The handling of latency in this literature is shown to be a particular methodological weakness, in light of what the last half-century of epidemiological writings on this issue have to tell us about the likely lag between RF-EMF exposure onset and the clinical presentation of both gliomas and acoustic neuromas -- the most widely studied outcomes to date. As a result of all these threats to their validity, most such studies to date probably underestimate the extent of causal relationships, as judged by the guidance published by Bradford Hill in 1965, between RF-EMF exposure and adverse health outcomes.

Conclusions and Recommendations: In view of these findings, international experts in this field should convene a Guidelines development process to inform future studies of associations between not only RF/EMF but other hard-to-measure environmental exposures, and human health outcomes using epidemiological methods. Wide dissemination of such guidelines could help journals and their

reviewers in this field (many of whom appear to be new to epidemiology) to execute and publish higher-quality studies, to better inform evidence-based policy.

MOBILE PHONE RADIOFREQUENCY EXPOSURE, A RISK FACTOR FOR THYROID CANCER?

Steven Weller

Griffith University, Brisbane, Australia

Abstract

Cancer incidence is increasing globally, Thyroid cancer in particular has seen a dramatic increase in the last 20 years. This is evidenced by the fact that Thyroid cancer was the 20th most common cancer by ranking in the year 2000 (World Cancer Report published by IARC in 2000) and has steadily moved up the ranks (8th most common cancer in 2020) and is projected to be the 4th most common cancer by 2030 in the United States. At the same time, global mobile phone subscriptions have also steadily increased to the point that there are more mobile phone subscriptions than the world's total human population (Statista 2022).

Pathological investigations have identified ionising radiation causes genetic mutations, which is a known pathway to cancer and researchers looking at nuclear fallout from the Chernobyl nuclear disaster have demonstrated clear causative effects in the development of Thyroid cancer. Studies investigating radiofrequency radiation effects on cells have also found evidence of genotoxicity along with increases in the production of free radicals (capable of directly damaging DNA).

Increasing usage of modern smartphones see the head and neck receiving the highest personal exposures to radiofrequency fields and therefore potentially increasing cancer risk.

While various types of approaches have produced evidence, none collate them and examine them comprehensively to inform on future research and policy development.

A PICTORIAL INTRODUCTION TO WAVE THEORY

Paul Ben Ishai

Department of Physics, Ariel University, Ariel, Israel

Abstract

Inherent to the discussion of exposure to electromagnetic radiation is the concept of the wave. However, most people involved in this discussion have only a rudimentary understanding of what is wave theory. Physicists do not help, as their language of math does more to conceal to the layman, rather than illuminate. In this short tutorial, I will try to introduce the basic concepts of wave theory visually. Starting from the basic definition of a wave, we will attempt to understand ideas such as propagation, the wave packet, dispersion, absorption, frequency decomposition. The intention here is to decipher the technical talk to give an intuitive understanding of the basics.

THE MODELING OF THE ELECTROMAGNETIC INTERACTION OF 5G/6G PULSED-SIGNAL RADIATION AND HUMAN SKIN

Noa Betzalel¹, Yuri Feldman¹ and Paul Ben-Ishai²

¹ Institute of Applied Physics, The Hebrew University of Jerusalem Israel, Jerusalem, Israel

²Department of Physics, Ariel University, Ariel, Israel

Abstract

The ongoing expansion of fifth-generation (5G) and future sixth-generation (6G) mobile communications (or wireless) is expected to result in widespread human exposure to millimeter-wave (mmWave) radiation globally. Electromagnetic waves can be absorbed by the human body and the specific absorption rate (SAR) is a numerical expression of the absorbed power of these waves. In the interaction of mmWave radiation with human beings, the skin is traditionally considered as just an absorbing sponge stratum filled with water. This misleading assumption leads to communication regulation standards based on non-realistic scenarios, such as SAR level measurements in a homogeneous liquid phantom that is supposed to emulate a human head. Another way of understanding the interaction of human body and electromagnetic waves is using simulations of human voxel models with resolution of less than a millimeter. But this approach is of an insufficient resolution for mmWave radiation. In fact, the skin is also an immunological organ so that exposures that take place on the surface can also have systemic effects influencing susceptibility to disease. Human skin consists of different components, among them, the sweat gland ducts and the dermal blood vessels that might have an important role in shaping the electromagnetic field distribution inside the skin in the mmWave. In our work we present an advanced human skin model, considering its stratified morphology, as well as the whole sweat gland ducts and the dermal blood vessels. Using this model we investigated, for the first time, the interaction of the human skin with pulsed-5G/6G signals. The result reveals how the skin reacts when being exposed to a realistic wireless communication radiation source. This allows a better understanding of possible health hazards.

CONDITIONS NECESSARY FOR DEMODULATION IN BIOLOGICAL TISSUES

Kent Chamberlin, PhD

University of New Hampshire Dept. of Electrical & Computer Engineering

Abstract

There has been speculation that biological tissues can demodulate high-frequency waveforms resulting from the exposure of those tissues to frequencies in the biological range. However, this speculation has yet to be confirmed through measurements or theory. The objective of this presentation is to explore what is known about the macro effects of propagation through complex media, including frequency-dependent and non-linear media. The supporting mathematics is presented along with relevant findings from past work. The conclusion is that non-linear media may be capable of demodulating high-frequency signals under certain conditions, although such demodulation may occur only at the cellular level.

PROBLEMS WITH THE COSMOS CELL PHONE RADIATION EXPOSURE AND BRAIN TUMOR RISK STUDY

Joel M. Moskowitz, PhD

School of Public Health, University of California, Berkeley

And

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

Abstract

I will provide a critical examination of the methodological problems that undermine the validity of results from the Cohort Study on Mobile Phones and Health (COSMOS) brain tumor risk study¹ and discuss the implications of this study for the field.

My presentation is based upon a letter prepared by the International Commission on the Biological Effects of Electromagnetic Fields (ICBE-EMF) that has been submitted to the journal *Environment International* where it is awaiting peer review.

¹ Feychting M, Schüz J, Toledano MB, Vermeulen R, Auvinen A, Poulsen AH, Deltour I, Smith RB, Heller J, Kromhout H, Huss A, Johansen C, Tettamanti G, Paul Elliott P. Mobile phone use and brain tumour risk – COSMOS, a prospective cohort study. *Environment International*. 2024, doi:10.1016/j.envint.2024.108552.

<https://www.sciencedirect.com/science/article/pii/S016041202400138>

THE COLLISION BETWEEN WIRELESS AND BIOLOGY

Paul Héroux

Department of Surgery, McGill University Health Center, Montreal, Canada

Abstract

The power and telecommunications industries have used two arguments to support their view that human exposures to non-thermal non-ionizing radiation is inoffensive. First, the radiation is non-ionizing. Second, the energy quanta of the radiation are too weak to overcome the competing energy of thermal motion. Those arguments rest on the Arrhenius equation (1889) and on the concept of energy of activation. Later scientific developments such as the Eyring equation (1935) and the Bennett-Chandler (1977-1978) equation on reaction rates, and the Second Law of Thermodynamics, recognized in living systems by Schrödinger as “negentropy”, all undermine these arguments.

The Second Law of Thermodynamics supplies the ionization claimed to be lacking, while some biological processes are independent of thermal motion.

The health effects of non-thermal non-ionizing radiation presently observed are in fact completely supported by physics. Furthermore, the expansion of wireless data rates is in direct conflict with preservation of a healthy environment.

SCIENCE, POLICY, AND EXPOSURE LIMITS TO RADIOFREQUENCY RADIATION (RFR)

Ronald Melnick, PhD

U.S. National Toxicology Program, NIEHS (retired)
Chair, International Commission on the Biological Effects of EMF

Abstract

The Food and Drug Administration, the agency that provides advice to the FCC on health risks of radiation emitted from wireless devices, nominated cell phone RFR to the NTP for toxicity and carcinogenicity studies in experimental animals. The FDA was concerned that existing exposure guidelines were based on protection from acute injury from RFR exposure, and may not be protective against any non-thermal effects of chronic exposures. However, after the NTP study demonstrated clear evidence of carcinogenicity and a study by the Ramazzini Institute also found increases in the incidences of tumors at the same sites as those in the NTP study, the FDA claimed there is no consistent or credible scientific evidence of health problems caused by the exposure to RFR emitted by cell phones. In 2011, IARC, which is an agency of the World Health Organization, classified RFR as a possible human carcinogen based largely on evidence from studies in humans. If the animal data had been available at that time, the classification would likely have been probable human carcinogen. Concerns of potential health risks from long-term exposures to RFR stem from the fact that exposure limits set by ICNIRP and the FCC in the 1990s were based on studies conducted in the 1980s in which 5 monkeys and 8 rats were exposed to various levels of RFR for up to one hour and evaluated for a single behavioral effect. Though hundreds of studies have reported adverse health effects of RFR at exposures below the threshold level derived from those short-term studies, ICNIRP and the FCC reaffirmed the same exposure limits in 2020. Apparently, scientific results of health risks do not seem to influence policy decisions on exposure limits to RFR. This needs to change. An independent re-evaluation of RFR exposure limits based on scientific knowledge gained over the past 25 years is urgently needed. This evaluation should address differences in individual sensitivities, the greater susceptibility of children, the spectral characteristics of signals used in wireless communications, effects on wildlife and the environment, and should apply methods used for more than 40 years by health agencies to set protective exposure limits to hazardous agents. Also, before deployment of future wireless systems near residences or public places, adequate health effects studies need to be conducted, risks assessed, and health protective exposure limits established. Policies based on assumptions of safety and denials of risk are not in the best interest of public health.

CASE REPORT: THYROID PAPILLARY CARCINOMA CAUSED BY LONG-TERM MOBILE PHONE USE?

Rob Brown, MD¹, Devra L Davis, PhD², MPH, Kent Chamberlin, PhD³

¹Radiology Partners Ltd, UPMC- Hamot, Environmental Health Trust

²Environmental Health Trust

³Chair and Professor Emeritus Department of Engineering - University of New Hampshire, ICBE-EMF, Environmental Health Trust

Abstract

Background: The thyroid gland is vulnerable to radiation exposure due to its superficial location in the neck. Ionizing radiation, particularly during childhood, is an established risk factor for the development of thyroid carcinoma. However, despite the lower exposures produced from digital diagnostic imaging equipment, the incidence of thyroid carcinoma continues to rise.

Methods: Case report. A 64-year-old healthy male with a palpable neck mass on physical examination was referred for diagnostic thyroid ultrasound. Sonographic evaluation revealed an incidental sub-centimeter thyroid nodule. FNA yielded a diagnosis of papillary carcinoma. A thyroid lobectomy was performed. The patient had no relevant risk factor, such as prior radiation exposure, and no family history of carcinoma. The patient did have a history of long-term, extended portable phone use, emitting wireless communication radiation at an 1880 MHz frequency. Non-ionizing radiation emitted by cell phones has been described as an environmental cofactor in the development of sub-centimeter thyroid carcinoma in individuals with genetic predisposition. By generating reactive oxygen species, wireless communication radiation can cause oxidative stress and lead to DNA damage and neoplasia.

Conclusion: Wireless communication radiation, and in particular cell phone radiation, may be contributing to the increased global incidence of thyroid carcinoma. Radiologists are a subset of physicians with training in radiation physics and should become aware of the potential this form of radiation has to generate oxidative stress and cause disease, including the development of carcinoma.

DIELECTRIC CONSTANTS

Frank Barnes

University of Colorado Boulder, Boulder, CO 80309, United States

Abstract

This presentation reviews the definitions of electric fields and the dielectric properties of materials. A simple model is presented to show why we can get relatively large and asymmetric values of the dielectric properties of biological materials such as muscle cells at low frequencies and that the values can be expected to decrease as the exposure frequency increases.

WIRELESS COMMUNICATION ELECTROMAGNETIC FIELDS: BIOLOGICAL AND HEALTH EFFECTS. BIOPHYSICAL MECHANISM OF ACTION

Dimitris J. Panagopoulos^{1,2,*}

¹Choremeion Research Laboratory, 1st Department of Paediatrics, Medical School, National and Kapodistrian University of Athens, Greece.

²Electromagnetic Field-Biophysics Research Laboratory, Athens, Greece.

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Abstract

Exposure to Electromagnetic fields (EMFs) of wireless communications (WC) has increased tremendously. This is an unprecedented phenomenon throughout biological evolution. WC EMFs consist of Microwave (MW) carrier waves, modulated by Extremely Low Frequency (ELF) signals, and included in on/off pulses repeated at various ELF rates. Moreover, they exhibit intense random variability in the Ultra Low Frequency (ULF) band.

All anthropogenic EMFs differ substantially from natural EMFs being totally polarized and coherent. The combination of polarization/coherence and intense variability is the key to biological activity.

Epidemiological and laboratory studies indicate connection between ELF or WC EMF exposure and cancer, electro-hypersensitivity, and infertility. Studies also find DNA damage and oxidative stress (OS) which explain the aforementioned pathologies.

While manmade EMFs cannot directly cause ionization, they are capable of doing this indirectly, by triggering production of reactive oxygen species (ROS) which can damage any biomolecules, including DNA. The (over)production of ROS and the consequent OS are triggered by irregular gating of voltage-gated ion channels (VGICs) in the cell membranes. The process is described by the ion forced-oscillation (IFO)-VGIC mechanism (Panagopoulos et al 2000; 2002; 2015; 2021): Mobile ions within VGICs forced to oscillate by the applied EMFs exert forces on the voltage sensors of the VGICs, similar or greater to the forces from membrane voltage changes that physiologically gate those channels, resulting in their irregular gating (dysfunction). Dysfunction of ion channels disrupts intracellular ionic concentrations. This triggers ROS overproduction and OS. The IFO-VGIC mechanism explains all known biological effects reported in the EMF-literature.

EXPOSURE SYSTEM FOR ELECTROMAGNETIC FIELDS INTERACTION WITH CIRCULATING RED BLOOD CELLS

Igal Bilik¹, Gregory Barshtein², Noa Betzalel³, and Yuri Feldman³

¹The School of Electrical and Computer Engineering, Ben Gurion University of the Negev, Israel

²The Faculty of Medicine, The Hebrew University of Jerusalem, Israel

³The Institute of Applied Physics, The Hebrew University of Jerusalem, Israel

Abstract

Multiple consumer applications, such as communications and sensing, use electromagnetic waves, which increase human exposure to electromagnetic fields. High-frequency electromagnetic waves penetrate upper human skin layers, interacting with the capillary network and inducing nonthermal effects on the circulating red blood cells (RBC).

This work presented an exposure system designed explicitly to investigate the effects of circulating blood exposure to plane electromagnetic waves. The developed system enables a systematic investigation of the electromagnetic field parameters that trigger the alteration in erythrocyte sedimentation rate (ESR) and macromolecule conformation. The system designs were meticulously optimized through extensive electromagnetic simulations.

The modulated electromagnetic field (EMF) exposure was precisely applied at a frequency of 3.5 GHz, with an amplitude of 10dBm. The pulse depth was set at 4.0 μ sec, and the rate was 8.0 μ sec, all maintained consistently for 20 min.

The EMF effect was verified using microwave dielectric measurements that were carried out in the frequency range from 500 MHz to 40 GHz. The analysis of the dielectric parameters of the main water relaxation peak was investigated.

The effects of electromagnetic exposure, both at the molecular and cellular levels, were investigated using whole blood and blood hemolysate as the test systems.

The fresh blood from eight healthy donors was collected for whole blood tests. Each blood sample was split into control and treatment portions (4 ml). The ESR was measured according to a standard protocol after 20 min of EMF exposure of whole blood in the exposed and control plastic Petri dishes. The elevated ESR was obtained in each EMF-exposed sample, compared with the control.

The blood hemolysate was obtained from the whole blood by performing complete hemolysis (destroying) of the RBCs. The microwave dielectric spectrum for blood hemolysate was measured

before (control) and after EMF exposure for 20 minutes. The control dielectric fitting parameters were compared with EMF-exposed solutions for five blood samples.

The analysis shows that EMF exposure leads to slight but a statistically significant acceleration of water's dielectric relaxation, with an increase in dielectric strength. The observed effect may be associated with a change in the balance between bounded and bulk water in the hemolysate.

Our preliminary work demonstrates that exposure to EMF results in the water state alteration both in the whole blood and blood hemolysate.

THERAPEUTIC VALUES OF MELATONIN AND OMEGA-3 ON THE OBESITY-RELATED HYPOTHALAMIC NUCLEUS

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Abstract

Aim: This study investigated the predisposition to obesity in the offspring's brain prenatally exposed to the electromagnetic field (EMF) emitted by mobile phones, and possible treatment options.

Methods: Adult Wistar albino female rats were randomly divided into seven groups: Control, Sham, EMF, EMF-Melatonin (Mel), EMF-omega-3 (ω 3), Mel, and ω 3. EMF exposure groups were applied a 900 MHz EMF during pregnancy. Mel-treated groups received 50 mg/kg/day Mel; in ω 3-treated groups, 0.93 g/ml ω 3 was given. The anxiety was examined with behavioral tests. Oxidative stress was evaluated in serum samples. Stereological, histopathological, and immunohistochemical analyses were performed on the arcuate nucleus in the hypothalamus of the 35-day-old offspring rats. The optical fractionator method was used for neuron counting.

Results: There was a significant decrease in the neuron number in the arcuate nuclei of the EMF group compared to the Sham group. The degenerated neurons in the EMF group were noteworthy. Additionally, increased anti-NPY immunoreactivity was observed in the EMF group. Anti-Ki-67 (+) staining was low in neurons of EMF and Sham groups. The EMF exposure increased catalase activity.

Conclusions: Maternal EMF exposure may trigger a predisposition to obesity in childhood by affecting NPY expressions in the exposed brain. Significant evidence regarding the therapeutic effectiveness of Mel and ω 3 was obtained in the brain.

Keywords: Electromagnetic field; Childhood obesity; Arcuate nucleus; Melatonin; Omega-3.

AN IN-VITRO STUDY OF THE IMPACT OF 900 MHZ RADIATION ON HUMAN SPERM: A CLINICAL AND MOLECULAR APPROACH

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Abstract

The use of technologies that produce and emit electromagnetic fields (EMF) is growing exponentially worldwide. The biological effects of EMF-emitting equipment, such as mobile phones and other wireless devices, have been studied in the last decade using in vitro and in vivo methods. Infertility is a growing health problem, and nearly half of cases are male-factor in nature. This study investigated the direct in vitro effect of 900 MHz radiation exposure on sperm parameters, genetic status, apoptotic markers, and the PI3K pathway in healthy normozoospermic men presenting to IVF clinics. This study included 15 healthy normozoospermic men presenting to IVF clinics. Each semen sample collected (from the IVF clinics) was divided into four groups, two controls (0.5 hour and one hour) and two EMF exposure (0.5 hour and one hour). Sperm parameter, genetic status (DNA fragmentation and chromatin integrity), apoptotic marker (cyt-c and caspase-3 expression) and PI3K/AKT pathway analyses were performed. Half an hour of exposure to 900 MHz EMF significantly reduced sperm motility. One-hour exposure to 900 MHz EMF exposure caused a significant increase in the expression level of p-AKT. Electron microscopic analysis revealed large-diameter vacuoles interconnected with nuclear pockets on sperm cell heads in the groups exposed to 30-minute and one-hour EMF. The in vitro assay results of this study are consistent with previous research showing that Akt phosphorylation increases in line with the duration of exposure to EMF, which further affects motility and prevents apoptosis.

GENOMIC IMPACTS OF ENVIRONMENTAL EXPOSURES TO EMF

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Abstract

Human exposure to radiofrequency electromagnetic fields (RF-EMF) is restricted to prevent thermal effects in the tissue. However, at very low intensity exposure "non-thermal" biological effects, like oxidative stress, DNA or chromosomal aberrations, etc., collectively termed genomic-instability can occur after a few hours. Little is known about chronic (years-long) exposure with non-thermal RF-EMF.

We identified two neighboring housing estates in a rural region with residents exposed to either relatively low (control-group) or relatively high (exposed-group) RF-EMF emitted from nearby mobile phone base stations (MPBS). 24 healthy adults that lived in their homes at least for five years volunteered. The homes were surveyed for common types of EMF, blood samples were tested for oxidative status, transient DNA alterations, permanent chromosomal damage, and specific cancer related genetic markers, like MLL gene rearrangements. We documented possible confounders, like age, sex, nutrition, life-exposure to ionizing radiation (X-rays), occupational exposures, etc.

The groups matched well, age, sex, lifestyle and occupational risk factors were similar. The years-long exposure had no measurable effect on MLL gene rearrangements and c-Abl-gene transcription modification. Associated with higher exposure, we found higher levels of lipid oxidation and oxidative DNA-lesions, though not statistically significant. DNA double strand breaks, micronuclei, ring chromosomes, and acentric chromosomes were not significantly different between the groups. Chromosomal aberrations like dicentric chromosomes ($p=0.007$), chromatid gaps ($p=0.019$), chromosomal fragments ($p<0.001$) and the total of chromosomal aberrations ($p<0.001$) were significantly higher in the exposed group. No potential confounder interfered with these findings. Increased rates of chromosomal aberrations as linked to excess exposure with ionizing radiation may also occur with non-ionizing radiation exposure. Biological endpoints can be informative for designing exposure limitation strategies. Further research is warranted to investigate the dose-effect-relationship between both, exposure intensity and exposure time, to account for endpoint accumulations after years of exposure. As established for ionizing radiation, chromosomal aberrations could contribute to the definition of protection thresholds, as their rate reflects exposure intensity and exposure time.

Additional studies are needed to clarify these relationships

STUDIES OF BEHAVIORAL IMPACT OF EMBRYOLOGICAL EXPOSURES TO EMF--THE NEED FOR MORE RESEARCH

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Abstract

A 2020 case control study of over 2000 pregnant women found that higher exposure to common electrical appliances such as computers, induction cookers and microwave ovens during their early pregnancy was associated with a higher risk of birth to infants with congenital heart disease. “Women should therefore reduce the usage of electrical appliances before and during pregnancy.” (Zhao et al. 2020)

Our earlier work found significant behavioral changes- lower memory and increased hyperactivity and significant behavioral changes in the offspring of mice exposed to cell phone radiation throughout pregnancy. Another study of more than 55,000 mothers and children in four countries found cell phone use during pregnancy linked to shorter pregnancy duration and increased risk for preterm birth.

When mice were exposed to cell phone signals while pregnant, their offspring showed increased hyperactivity and lower memory scores. In addition, neurological tests revealed abnormal development of neurons in the part of the brain linked to ADHD. Several other experiential studies have found that in utero cell phone exposure leads to damaged brain development in mice and rats. Most recently, the National Toxicology Program found genotoxic effects in the frontal lobe of the brain in mice and rats exposed to daily low levels of radiofrequency radiation.

In addition to these animal studies, several studies on children have found that higher cell phone exposure during pregnancy is associated with behavioral issues in children. Researchers from the University of California School of Public Health in Los Angeles have published two studies (2008 and 2012) looking at tens of thousands of children. Researchers concluded that children exposed to cell phones both before and after birth were more likely to have emotional or behavior problems than children who were not exposed to phones. In 2017, the largest study to date to use data on prenatal cell phone use collected from parents in five countries found a link between high prenatal cell phone use and hyperactivity/inattention problems in children.

There is a need for additional research to confirm these associations and to clarify the mechanisms that may be involved.

THE MISUSE OF DIGITAL DEVICES AND THE EMITTED EMF/RF: THE TWO SIDES OF A HIGHLY RISKY COIN-CYPRUS HOLISTIC APPROACH TO RAISE AWARENESS, INFLUENCE POLICIES AND REDUCE RISKS IN HOME-SCHOOLS-HOSPITALS

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Abstract

In the 21st century, digital technology is fast emerging in the life and education of our children with many benefits, but also with well-documented risks for psychological, mental health, development and child prosperity. Both the act of engaging with technology and the EMF emissions generated by this technology can interact causing multiple health effects. Of particular concern is effects on brain development – leading to poor mental health and negative effects on learning abilities, disturbed sleep patterns, eye damage, and changes to physical health. Thousands of apps and devices are developed and marketed without pre-market testing on potential effects on the developing child brain, on cognitive, communication and other mental abilities. In addition digital wireless technology emits non ionizing radiation (EMF/RF). Despite the scientific evidence pointing to severe and, in some cases, irreversible health damage from the emitted radiation, the scientific controversy, existing policies /legislation and the fact that EMF/RF effects are primarily long term, make parents and society, including parts of the medical community, unwilling to take precautionary measures. On the contrary effects from the misuse of digital devices, the dependence and addiction are now becoming more obvious to the parents, affecting more and more children. This is why some measures like the prohibition of mobile phones in schools, are primarily taken to address the misuse of devices and applications rather than radiation exposure. We must take advantage of this, to convey more effectively our message and raise awareness in relation also to the effects of radiation EMF/RF. We are therefore changing our strategy by showing the interaction and potential synergy and address both sides of the same coin, namely the impact of the misuse of devices and applications and that of radiation of wireless technology. This is the scientific basis of our multifaceted campaign «Child Protection Shield» launched in 2023, addressed under the objective “Safe use of digital technology, protection from radiation, dependence and addiction” under 4 sub-objectives: a) training of health professionals and teachers -intervention at hospitals and nurseries, b) raising awareness among parents, training on rational use and active/passive exposure reduction practices (e.g. wired internet at home and school) c) children empowerment from early childhood in self-protection from radiation and self regulation and control so that they can use technology without depending on it and d) Science based interventions to support policies and legislation protective for children.

The aim of the presentation is to highlight the interaction and effects of the misuse of technology and exposure to radiation on children and how this fact can form a basis of a more effective holistic approach in raising awareness and in promoting precautionary policies and measures. The Cyprus approach and actions taken with focus on hospitals and nurseries as well at policy and legislation level will be presented.

INDIVIDUAL SENSITIVITY TO EMF: WHY WE NEED PROTEOMICS RESEARCH

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Abstract

Part of the population considers themselves sensitive to radiofrequency electromagnetic radiation emitted by wireless communication devices and networks (RF-EMF). It is logical to consider that individual sensitivity to RF-EMF exists. For every environmental factor, there is a subpopulation of individuals more sensitive than the majority of people.

Individual sensitivity to RF-EMF is not recognized by the WHO as a physical health-affecting factor. There are no approved medical tests for its diagnosis.

To find sensitive persons we need to analyze protein level responses. Proteomics studies interactions, function, composition, and structures of proteins and their cellular activities. Proteomics provides a better than genomics understanding of the structure, function, and physiology of the organism. Changes in gene expression do not affect physiology for as long as these gene expression changes are not translated into changes in the expression and activity of proteins. Information on the amount and activity of proteins in cells obtained with proteomics methods gives a better understanding of the physiological status of the cell. Only 23 proteomics studies examined proteome changes occurring in response to RF-EMF exposures, and only one (sic!) was performed in human volunteers. No physiology studies examine the individual sensitivity to RF-EMF exposures in human volunteers.

In conclusion, there is an urgent need for human volunteer studies, where the changes in global protein expression and activity would be examined using proteomics methods in control and RF-EMF-exposed persons. Comparison of the profiles of proteins in control and in RF-EMF-exposed persons might/will reveal biomarkers of individual sensitivity.

Effects of Environmental Electromagnetic Radiation on the Human EEG

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Dysfunction of the electromagnetic nervous system may result in a wide variety of signs and symptoms related to external exposures to artificial environmental electromagnetic radiation (e.g. WiFi radiation).

Dysfunction of the brain may be detected by surface electroencephalography (EEG), a common, readily available, and affordable neurodiagnostic test which can be performed at any age in a relatively short period of time (20-60 minutes).

When properly interpreted by a trained and board-certified electroencephalographer/neurologist, EEG changes – often subtle – may show clues to underlying causes. In fact, such EEG changes have been described for over 30 years related to the 1986-1987 Chernobyl disasters (described below).

As a fundamental principle of physics, an electromagnetic field (EMF) will influence a nearby electromagnetic field.

Thus, it should come as no surprise that the brain – an electromagnetic organ system – changes in response to external EMF, specifically increasing exposure to artificial environmental EMR, have long been documented to occur.

These EEG changes related to EMR exposures may occur intentionally from therapeutic applications (e.g., radiation therapy, neuromodulation therapies, etc.), or inadvertently from increasing artificial environmental EMR (e.g., increasingly continuous exposure to ‘the internet of things’, e.g., WiFi radiation in the forms of electronic devices, wireless transmission, telecommunication technology, etc.) In any case, all living beings are exposed - not only to natural EMF produced from our atmospheric and galactic environment - to increasingly higher energy, faster frequency artificial EMR.

This paper describes surface EEG (e.g. resting state EEG) changes which may be correlated, at least in part, with increasingly pervasive and invasive exposures to artificial environmental electromagnetic radiation. Additionally, quantitative analysis of the EEG (QEEG) with FFT and spectral analysis, produces functional mappings which demonstrate regional and local changes in spectral power, connectivity of neural networks, and coherence.

EEG changes currently being seen in routine rsEEG interpretation will be presented. These changes include (1) increasing fast (beta) activities, (2) slowing and/or decreased power of the posterior dominant rhythm, (3) theta and delta frequency slowing – often asymmetric left>right temporal/frontal, (4) evolution of isolated epileptiform discharges (IEDs) with and without seizure history, and (5) extremely frequent circadian/sleep changes.

The importance of accurate surface rsEEG analysis is reviewed for its immense value in correlation with clinical implications when correlated with a person's history and clinical symptomatology.

INVESTIGATING ELECTROMAGNETIC HYPERSENSITIVITY: A FOCUS ON HUMAN EXPERIMENTAL STUDIES

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Abstract

Much scientific controversy has surrounded the subject of Electromagnetic Hypersensitivity (EHS). This derives primarily from inconsistencies between the clinical histories of people with EHS and the disparate findings of human experimental studies. The many appeals from international medical and scientific experts to reduce exposure limits and create low EMF zones for protection of this group have repeatedly been denied on the basis of these studies. The clinical character of EHS, methodology of provocation studies and reviews which have recently analyzed them, will be discussed alongside exploration of central ethical concepts.

EMF EFFECTS TO WILDLIFE AT ECOSYSTEM LEVELS

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Abstract

Ambient levels of nonionizing electromagnetic fields (EMF) have risen sharply in the last five decades to become a ubiquitous, continuous, biologically active environmental pollutant, even in rural and remote areas. Many species of flora and fauna, because of unique physiologies and habitats, are sensitive to exogenous EMF in ways that surpass human reactivity. This can lead to complex endogenous reactions that are highly variable, largely unseen, and a possible contributing factor in species extinctions, including in localized environments. Non-human magnetoreception mechanisms are discussed. Numerous studies across all frequencies and taxa indicate that current low-level anthropogenic EMF can have myriad adverse and synergistic effects, including on orientation and migration, food finding, reproduction, mating, nest and den building, territorial maintenance and defense, and on vitality, longevity and survivorship itself. Effects have been observed in mammals such as bats, cervids, cetaceans, and pinnipeds among others, and on birds, insects, amphibians, reptiles, microbes and many species of flora. Cyto- and geno-toxic effects have long been observed in laboratory research on animal models that can be extrapolated to wildlife. Unusual multi-system mechanisms can come into play with non-human species — including in aquatic environments — that rely on the Earth's natural geomagnetic fields for critical life-sustaining information. There is enough information to raise concerns about today's ambient exposures to nonionizing radiation at ecosystem levels. Wildlife loss is often unseen and undocumented until tipping points are reached. 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. Long-term chronic low-level EMF exposure standards, which do not now exist, should be set accordingly for wildlife, and environmental laws should be strictly enforced. There are no exposure standards for wildlife species of any kind, and those that exist for humans are inappropriate for the unique physiologies of non-human species.

THE EFFECTS OF MAN-MADE ELECTROMAGNETIC FIELDS ON PLANT HEALTH, GROWTH, AND METABOLISM

Aaron Matthew Pilarcik

Massachusetts Institute of Technology

Abstract

In this presentation, we will explore the effects of man-made electromagnetic field exposure on plant growth and metabolism. We will start with a look at an experiment examining the effects of 2.4 GHz electromagnetic field exposure on seed germination and plant growth. We will then take a deeper look at the effects of electromagnetic fields on plant metabolism with a particular focus on preliminary work studying calcium signaling. We will also look at a decomposition of characteristic oscillatory frequencies in calcium signals using wavelet analysis.

STEPS NEEDED TO ADDRESS DEFICIENCIES WITH RADIATION IMPACTS TO WILDLIFE

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Abstract

As part of the topic on Policy Developments and Regulatory Gaps, this presentation calls first on the U.S. regulatory agencies, including EPA, FCC, USFWS, USDA, USFS, DOC, and others, to designate air as 'habitat' so EMF can be regulated like other pollutants. Radiation standards used by the FCC are over 35 years out of date, still based on thermal heating, which as recently ordered by the federal Court must be changed. Discussed is the need, including some suggestions, for radiation exposure guidelines for wildlife, including for long-term, chronic low level exposures, with a discussion of the use of the ALARA radiation principles ("as low as reasonably achievable"). The call to reinstate a National Environmental Policy Act (NEPA) radiation EIS review of the National Telecommunications & Information Administration (NTIA) emergency broadcast towers affecting migratory birds is made. These efforts are put into the context of the ongoing 6th major extinction epoch. EMF impacts to wildlife will only become additive, increasing the already daunting challenges from many other cumulative effects.

U.S. FEDERAL REGULATION OF WIRELESS RADIATION, A CASE STUDY IN REGULATORY GAPS

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Abstract

Government approaches to regulating wireless radiofrequency radiation vary greatly depending on their methodology for development, regulatory framework and adoption process. Some countries have a robust regulatory structure including: regular science-based review of safety limits, post-market compliance and enforcement programs for phones, devices and network antennas, funded research activities and interagency collaboration. Policies to safeguard children include; banning the sale of cell phones and restricting advertising for young children, reducing Wi-Fi exposure in classrooms and daycares and prohibiting cell towers near schools. Transparency measures include public websites allowing the public to access RF transmitter locations, RF measurements and/or compliance reports as well as post market surveillance data for phones and RF emitting devices.

However, the United States has none of these federal regulatory processes. Bioeffects research and field monitoring has ceased. Exposure guidelines and cell phone test methods are unchanged since 1996. The FCC concealed data showing phones exceed limits when tested in real-world positions, close to the body. While the FCC states it defers to other agencies to stay abreast of the scientific data, there are no U.S. federal agencies that have issued risk or hazard evaluations which include consideration of the broad range of adverse biological impacts. State and local policy efforts in the United States have resulted in a potpourri of legislation, policies and initiatives.

Several countries have regulatory limits for environmental RF levels far more stringent than FCC and ICNIRP, yet research indicates effects at levels far lower than their limits. The development of science-based, biologically protective exposure limits and updated compliance procedures are urgently needed as well as additional policies to safeguard children, the medically vulnerable, workers, and wildlife.

THE ENFORCEMENT PARADOX

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National Spectrum Management Association and Environmental Health Trust

Abstract

The Federal Communications Commission does not routinely monitor radiofrequency radiation from antennas. Monitoring of rooftop antennas in Washington, DC reveals major deviations from 28 year old guidelines. Those guidelines were set solely to prevent heating or shock and do not recognize the substantial evidence that exposures that are nonthermal produce major biological impacts. This talk will feature real-time measurements of rooftop antennas that greatly exceed the outdated guidelines. Persons unaware of these exceedances place themselves at risk of serious irreversible damage. Signage is required by law but is seldom in place to avoid these dangerous conditions. A framework for promoting competition on safety by manufacturers is advocated as a way to address the current problems.