

Date: October 20, 2026

To: U.S. Department of Health and Human Services

From: Tamara Filas

Subject: Public Comment in response to Request for Information (RFI) on Electromagnetic Fields (EMFs), Radiofrequency (RF) Radiation, and Wireless Radiation Exposure

Docket ID No.: HHS-OASH-2026-0397

My comments below are numbered to correspond with the questions posed within the Department's RFI. Headings and questions from the RFI are represented as clickable shortcuts in the Navigation panel of Microsoft Word. All references to page numbers and footnotes within this document are clickable hyperlinks.

Public Experiences and Reported Potential Adverse Health Effects

Note: Question 1 represented the RFI Instructions.

2. In your response, please describe which perspective(s) your comments represent: individual consumer, patient, family member, or caregiver; healthcare professional; worker with occupational exposure; equipment or product manufacturer; service or infrastructure provider; business; industry group; government; research entity; or another type of organization or perspective.

My comments represent a combination of perspectives, uniquely blending scientific training with direct environmental observation:

- An independent researcher and lifelong learner holding a Master's Degree in Biology from the University of Michigan
- A Michigan-certified former public school educator with over a decade of brick-and-mortar classroom experience, with a deep concern for child welfare and development
- an American consumer who prioritizes long-term health and safety over convenience and popularity
- An individual who has systematically and conclusively, scientifically verified that her exposure to anthropogenic RF/EMF from specific, known sources is directly correlated with the onset of health effects/symptoms, some of which can be medically classified as serious, life-altering or life-threatening health *conditions*

In addition to a comprehensive foundation in biology, my academic background includes advanced collegiate coursework in biochemistry, organic and inorganic chemistry, and physics (focusing on mechanics, thermodynamics, acoustics, electromagnetism, and optics). My specific training in physics was instrumental in identifying the clear correlation between specific physiological effects/symptoms I was experiencing and known, singular RF/EMF exposures. *Physiological* effects relate to disruptions to the physical and biochemical functions of a living organism and its parts.

Based on systematic environmental tracking with RF meters, and concurrent documentation of my own personal experiences, I have conclusively determined that exposure to specific, known sources of RF/EMF is directly correlated with health effects, as explained in question 3 which begins on pg. 4.

I believe that a significant obstacle to the widespread regulatory and public acceptance of EMF/RF health implications is a general unfamiliarity with fundamental biophysics and cellular electrophysiology. Human physiology is inherently electrical.¹ Vital homeostatic processes, such as the signaling of neurons, maintaining cardiac rhythms, and contracting muscles, rely entirely on the tightly regulated influx and efflux of charged ions (such as sodium, potassium, and calcium) across cell membranes (also called the plasma membrane).

Human biology depends on these intrinsic electrochemical gradients to function properly. External, anthropogenic (created, caused, or influenced by human activity) non-ionizing electromagnetic radiation (EMR) introduces *non-thermal* disruption of these delicate biological systems. Non-thermal means without raising the temperature (i.e. without heating).

Everyone knows that microwaves cause heating, since this is the basis of the operation of the microwave oven in most people's kitchens. However, there is an urgent need to bridge the gap in public awareness regarding the following facts:

- Microwaves *are* radio waves—they're just at the higher end of the radiofrequency (RF) spectrum, which means they have shorter wavelengths and carry more energy per photon than the radio waves at the lower end of the RF spectrum.
- Waves in the microwave frequency spectrum are emitted by antennas from cell towers, cell phones, Internet of Things (IoT) devices using Bluetooth or Wi-Fi, etc.
- A microwave oven uses the same frequency as Bluetooth and many internet routers, 2.45 GHz (See pg. 58).
- Exposure to anthropogenic RF/EMF sources has been rigorously scientifically demonstrated for *decades* to be correlated with numerous *non-thermal* biological and health effects across all forms of life.

¹ Becker, R. O., & Selden, G. (1985). *The body electric: Electromagnetism and the foundation of life*. William Morrow.

- Our country's current safety standards in regard to human exposure to RF/EMF are severely outdated since they are based solely on preventing *thermal* effects (i.e. keeping our tissues from cooking like the food in the microwave).
- A newly identified and characterized (but not yet officially *recognized* by the CDC) disease exists called Electromagnetic Hypersensitivity (EHS). Persons afflicted are especially sensitive to exposure to non-native (man-made) non-ionizing electromagnetic radiation, particularly RF/EMF.

Both current and past RF/EMF research has overwhelmingly demonstrated a strong correlation between exposure to RF/EMF and the experience of various health effects, some of which are actually health *conditions* as defined medically, and therefore not simply minor "effects."

Countless animals have sacrificed their lives for a plethora of research that has demonstrated disruption to every single major physiological system (i.e. brain and nervous system, heart and circulatory system, etc.) following exposures to RF/EMF. The experimental animals' physiological systems are similar enough to ours that this past research is most definitely applicable to humans. Therefore, further live animal studies should be phased out.

*In vitro*² studies are the future of research into the health effects of RF/EMF. *In vitro* studies have already demonstrated extremely specific biophysical disruptions at a cellular level, propelling us closer to understanding clear, known mechanisms to explain why certain specific health effects and health conditions commonly occur following exposure to RF/EMF.

The implementation of updated, biologically-based RF/EMF exposure standards is crucial in order to protect human life and all organisms on earth from any further harm from anthropogenic wireless radiation.

I also call on the CDC to finally recognize Electromagnetic Hypersensitivity (EHS) as a legitimate, *physiological* disease, as overwhelming scientific research has already proposed clear biological mechanisms for this pathology, as explained in detail in Question 17 on pg. 101. EHS must be codified in the U.S. Clinical Modification (ICD-10-CM).

² *In vitro* is a Latin term that translates literally to "in glass." In science and medicine, it describes biological processes, experiments, or procedures that take place outside of a living organism, typically inside a laboratory test tube, petri dish, or culture flask.

3. We invite individuals, families, caregivers, healthcare professionals, and organizations to share experiences regarding potential adverse health effects they believe may be associated with exposure to RF/EMFs. Respondents are encouraged to provide as much detail as they are comfortable sharing, recognizing that responses to this RFI will be public and therefore should not include PII or PHI.

My 5.75-year Personal Case Study

Since January 2021, I have maintained a comprehensive log documenting my personal experiences with singular, known exposures to specific RF/EMF sources, and the resulting health effects/symptoms experienced. Visible physiological symptoms have been documented photographically to complement the log where applicable.

Conversely, I have also tracked health effect/symptom *improvements*, including complete remissions, following targeted radiofrequency (RF) mitigation on my property and throughout my home.

Advanced Large Language Models (LLMs) possess the computational capacity and analytical framework to allow for the dynamic categorization of my health effect log by device type, experienced health effect, frequency of exposure, specific chronological windows, etc. AI analysis transforms a qualitative personal narrative into a highly searchable, data-driven personal case study.

At the time of this submission, the log is 73 pages long, containing over 42,000 words, and documents repeat instances of at least 35 distinct health symptom/effect pairings I have experienced to date, following singular, known exposures to specific RF/EMF sources.³

The Difference Between A Health “Effect” and A Health “Symptom”

Because it is easy and common to confuse these two related terms, and both are important to explain both the objective and subjective effects of exposure to RF/EMF, I wanted to clarify their medical definitions before my discussion about the effect/symptom pairings I’ve personally experienced as a result of exposure to RF/EMF:

A health **effect** is any *objective*, measurable change in bodily function or structure.

A health **symptom** is a *subjective* experience felt and reported only by the person.

³ There are no doubt even more health effects documented in my log than the 35 retrieved through the use of a Large Language Model (LLM), which was limited in regard to what text it was able to discern to be representative of health effects. This issue could easily be remedied by first conducting a revision of the log whereby all health effects are translated into known, standardized terms before queries are made using the LLM. When I began the log, I never imagined I would be using AI to extract its data, or I would have already been standardizing the effect terms.

An *effect* is what happens to the body biologically speaking, while a *symptom* is how that change actually feels to the person experiencing it. Here are two examples:

Effect: A muscle spasm is a common physiological health *effect* correlated with exposure to RF/EMF.⁴

Symptom: The feeling of pain during the muscle spasm is a *symptom*.

Effect: The *effect* of exposure to certain frequencies of RF/EMF is correlated with the initiation of an inflammatory response in some people's skin.

Symptom: The feeling of burning or itching skin, is a result of the biological effect of the inflammatory response in the body (nerve responses or release of histamines).

The Gift of Awareness

It is important to understand that exposure to RF/EMF, even in levels hundreds or thousands of times lower than the current exposure standards allow, results in numerous health *effects* upon humans. It results in biological effects to *all* living organisms. Most of these effects are not felt as *symptoms*, at least not by the average person. The damaging effects of RF/EMF exposure are usually a silent bodily harm that slowly degrades one's health.

I consider myself extremely fortunate to have experienced a variety of unique *symptoms* definitively traceable to countless singular exposures to specific, known RF/EMF sources. Prior to my "Eureka Moment" in 2021 (see pg. 26), I was like most people—the amount of RF/EMF in my environment, and whether it could be harmful to my health, just wasn't on my radar (pardon the pun!).

Had I not been cast into the role of the "canary in the coal mine," I would never have discovered that my exposure to anthropogenic RF/EMF was contributing to health effects and even health *conditions* far beyond those I personally detect through simply *feeling* the symptoms associated with a certain health effect or condition. I would never have delved deeper into the scientific research, seeking a comprehensive understanding. Most importantly, I would never have realized that the health effects/symptoms I experienced could be dramatically reduced or even eliminated completely simply by decreasing my exposure to RF/EMF through lifestyle changes and specialized RF shielding.

⁴ Muscle spasms often seem benign, as most people associate them with minor leg cramps. However, depending on the muscle(s) affected, spasms can be life-threatening. For instance, spasms in the heart muscle or airway smooth muscles (ASM) can trigger sudden cardiac arrest or severe, fatal asthma attacks. RF/EMF exposure has been correlated with the elicitation of spasms in both heart muscle (i.e. palpitations) and ASM.

Hopefully, I won't suffer the fate of the actual canaries used in the coal mines of the past, but will instead be set free from my "cage" someday. I remain optimistic that positive change is on the horizon, and I hope my suggestions for a safer, healthier future are seriously considered and adopted.

Examples of information that may be helpful to include are the following:

a. The type(s) of wireless technology or RF/EMF source(s) involved (i.e., mobile phones, Wi-Fi, smart meters, wireless infrastructure, wearable devices, occupational equipment).

Tracking my environment utilizing calibrated RF meters revealed distinct anthropogenic RF/EMF sources systematically verified to correspond with my experienced physiological effects/symptoms following singular, known exposures to a specific RF source.

Documented RF sources correlated with effects/symptoms include, but are not limited to:

- **Telecommunications and Consumer Infrastructure:**
 - Macro cell towers
 - Radio transmission towers
 - Localized cellular masts
 - Municipal wireless traffic-light camera sensors and intersection masts
- **Mobile and Cordless Telephony:**
 - Candy-bar style 2G CDMA cellular phones
 - 3G cellular flip phones
 - 4G and 5G cellular smartphones
 - Digital Enhanced Cordless Telecommunications (DECT) home phone landline systems
- **Utility Grid Infrastructure and Maintenance:**
 - Advanced Metering Infrastructure (AMI) Mesh Network
 - regional mesh network routers
 - smart mesh network electric and gas meters
- **Consumer Electronics and Household Appliances:**
 - Residential Wi-Fi internet routers (specifically 2.4 GHz and 5 GHz)
 - Wireless printer
 - Wireless personal computing peripherals (wireless mice and keyboards)
 - Standard consumer microwave ovens
 - Smart residential air conditioning unit
 - Specialized 3D television utilizing wireless synchronization eyewear

- **Transmitters on vehicles:**
 - Global Positioning System (GPS) tracking arrays and wireless security camera systems deployed on municipal utility, mail delivery, and parcel cargo vans
 - High-power mobile communication transceivers in Emergency Medical Services vehicle
- **Localized Bluetooth or Wi-Fi Connected Devices and Specialized Diagnostics:**
 - Treadmill with Bluetooth enabled
 - Personal Bluetooth headset
 - In-vehicle Bluetooth used to sync 3G cell phone
 - Portable GPS navigation units with default-ON Wi-Fi/Bluetooth
 - Wireless smart doorbell
 - Consumer heart monitor (EKG) with Bluetooth enabled

b. The nature, duration, frequency, and approximate timing of the reported exposure(s).

History of Exposure to RF/EMF

- **Microwave Oven (Mid-1970s–2021):** Testing in 2021 with a calibrated RF meter documented substantial RF radiation leakage from the appliance's structural seals during operational cycles, and its use was immediately discontinued.⁵
- **Cordless Telephone Systems (1994–2008):** Used for my POTS landline at my previous home, I had two base stations, each with one handset, both different brands. One was in the kitchen, and the other was in my second floor bedroom on a nightstand.
- **Personal Cell Phone (1999–2021):** I acquired my first cell phone, a candy-bar style 2G CDMA handset, in December 1999. Between that initial phone and 2021, I utilized two subsequent flip-phone models, with the final model being a 3G phone acquired in 2008. I continuously operated this specific 2008 flip phone for thirteen years until April 2021, when I ceased cell phone use entirely.
- **Wi-Fi Infrastructure and Peripherals (2001–2021):** In 2001, a Wi-Fi router was installed to provide internet access throughout my former home. Wi-Fi was also continued in my current home. At both houses, I had a PC and laptop connected via Wi-Fi. In 2014, I purchased a tablet utilized with Wi-Fi.

In the spring of 2021, I transitioned to a fully wired Ethernet infrastructure with wired peripherals. Tablet use was discontinued because I could not find a compatible USB Ethernet adapter (the tablet didn't have an Ethernet port).

⁵ All microwave ovens leak RF radiation, which is easily testable with a consumer-grade RF meter sensitive to RF radiation in the 2.45 GHz frequency. Intensity levels of this measured leakage are of course, at legal levels set by the current, outdated governmental exposure standards that only consider *thermal* effects.

- **Bluetooth Headset and Vehicle Transmitter (2011–2021):** From 2011 through 2021, I often used a Bluetooth headset with my cell phone, as well as with dictation software on my PC. In my car, a paired Bluetooth connection was maintained with my cell phone for a hands-free connection. In April 2021, usage of the Bluetooth headset was permanently discontinued, and the Bluetooth connection was disabled in my vehicle.
- **Smart Electric and Gas Meter Mesh Network Infrastructure (2013–present):** There are two smart electric meters on two different neighbors' homes, each pointing at my kitchen sink area. I have two corner kitchen windows by the sink, and each window is in a direct line of sight to one of the two meters. The meter visible from the south-facing window contains the regional router for the houses in the area. Both neighbors' smart electric meters' RF emissions are currently being attenuated with specialized RF shielding mesh in my yard, in my home's window screens, and within my home.

The radio components were removed from both the electric and gas smart meters on my own home in September 2023.

- **5G Rollout in my area (2020 – present):**
Verizon rolled out its 5G to my community in the summer of 2020.⁶

I have not detected any 5G transmissions in the 24 – 40 GHz frequency range on my property which my mmWave RF meter would be able to detect.⁷

On multiple occasions, I have directly correlated a new, distinctive-sounding signal's appearance and disappearance on my RF meter, with a visible neighbor outside talking on their cell phone and then ending their call. This RF meter is sensitive in the range of 200 MHz – 8 GHz, which means it would detect a mid-band 5G signal.

This abrupt beginning and ending of a signal that appears to be coming from above my home, rather than to the side, matches exactly how a 5G mid-band signal from the macro cellular antenna behaves: Because 5G signals use new, steerable antennas, the antenna on the tower aims a *directed* beam right at my neighbor's phone when it is in use. Living in a suburban home in close proximity to my neighbors, that localized beam is wide enough to also cover my own house.

⁶ According to a past website of Verizon's I used to check which indicated its 5G installation progress down to the street level, July 2020 marked the time period that streets in my area started to be highlighted in red, meaning they were "covered."

⁷ In addition to a heavily modulated mid-band signal, 5G communications technology also uses signals of a much higher frequency, referred to as millimeter waves (mmWaves) because of their small wavelength. mmWave RF transmissions would not be detected on a standard consumer-grade RF meter like the mid-band 5G signal that was detected and described. It is my understanding that mmWave technology is currently primarily employed in dense, urban areas, which is likely why no mmWaves have been detected in my suburban neighborhood.

It should be clear that I was not anticipating experiencing any effects/symptoms from the 5G rollout. At that time, I had not yet performed *any* research on the health and biological effects of RF/EMF, nor had I connected *any* effects/symptoms to RF/EMF in July 2020 when 5G was rolled out in my area.

c. The potential adverse health effects experienced.

Experienced physiological reactions are *established* health effects, not *potential*

In responding to this section, a critical linguistic distinction needs to be made regarding the term "potential" as used in the Department's prompts for questions 3c, 3d, and 3f. While a hypothetical or generalized application of "potential adverse health effects" is appropriate when evaluating population-level risks, applying this qualifier to the real, documented physiological effects/symptoms of RF/EMF-sensitive individuals inadvertently diminishes the objective reality of their conditions.

This position is supported by established global health frameworks. A 2024 academic analysis titled, "*The lack of international and national health policies to protect persons with self-declared electromagnetic hypersensitivity*," outlines how the World Health Organization ("WHO") Constitution inherently encompasses the experiences of self-declared EHS individuals under its core definition of health (emphasis added):⁸

"Health impairment claims of the self-diagnosed EHS persons could and should be already now considered as relevant health impairment. The definition of health presented in the Constitution of the World Health Organization says (www.who.int/about/governance/constitution):

Health is a state of complete physical, mental and social well-being and not merely the absence of disease and infirmity

The health of all peoples is fundamental to the attainment of peace and security and is dependent on the fullest co-operation of individuals and States

Governments have a responsibility for the health of their peoples which can be fulfilled only by the provision of adequate health and social measures

It means that **already now, the symptoms of suffering by the self-declared EHS persons are 'health effects' as per WHO Constitution.** Furthermore, it means that the existing man-made RF-EMF emitting devices and exposures emitted by these, are causing health effects because the 'mental and social well-being' of some persons is being affected, and this phenomenon is clearly recognized by the WHO."

⁸ Leszczynski, D. (2024). The lack of international and national health policies to protect persons with self-declared electromagnetic hypersensitivity. *Reviews on Environmental Health*, 39(2), 163–189. <https://www.degruyterbrill.com/document/doi/10.1515/reveh-2022-0108/html>

Under these established international standards, an anthropogenic environmental stressor such as RF/EMF, which directly impacts an individual's physical, mental, or social well-being constitutes an active, verifiable health impairment rather than a *theoretical* possibility.

Consequently, my responses to Questions 3d and 3f below evaluate my experienced physiological reactions as *established* health effects, not *potential*.

While I truly would like to explain my effect/symptom combinations by name, a public comment is not the right place to disclose highly specific, private health details. I will be unable to respond to Question 3c with the list of *named* health effects and symptoms I've connected to singular, known RF/EMF exposures.

To ensure a rigorous analysis while maintaining necessary personal privacy, I have chosen five (5) distinct health effect/symptom pairings to discuss in as much detail in as possible the next sections without revealing any medical information/terminology. These will be designated by a unique numeric identifier (e.g., Effect/Symptom 1).

It should be understood that the five (5) effect/symptom pairings detailed in this comment represent less than 1/7 (one seventh) of the effect/symptom pairings documented in my log (See footnote 4). My discussion within this comment therefore represents a mere fragment of my documented personal experience.

d. When potential adverse health effects first appeared relative to when exposure began and whether any changes in exposure coincided with potential adverse health effects.

Some physiological effects/symptoms are considered to be *cognitive*—such as headaches, brain fog, or general fatigue. Cognitive symptoms can still be physiological in their origin because they are very frequently caused by underlying physical changes in the brain and body, sometimes on a cellular level. However, since cognitive symptoms can also be subtly influenced by confounding daily factors like stress and hydration, I have intentionally *excluded* cognitive symptoms from the five health effect/symptom studies discussed in this comment.

Restricting my commentary to *verifiable* physiological reactions ensures that the documented correlations between RF/EMF exposure and health effects are firmly anchored in observable data.

Crucially, my systematic tracking has also established a clear *bidirectional* correlation: not only did acute physiological health effects/symptoms manifest predictably immediately upon exposure to active RF/EMF sources, or shortly thereafter; but systematic *removal or isolation* from those specific RF/EMF sources consistently reduced or completely eliminated the occurrence of those same health effects/symptoms.

About the five Effect/Symptom pairings to be discussed:

- Effects/Symptoms are presented below in a chronological timeline of their onset, with the year of onset listed first.
- In parentheses after each numbered effect/symptom, are the RF/EMF sources I have systematically determined to be correlated with this specific effect/symptom
- In all five cases, while some health effects/symptoms were experienced years or even decades earlier, correlations with specific RF/EMF sources were not determined until 2021 or later, when *singular*, known exposures to specific RF/EMF sources were finally able to be correlated with each health effect/symptom.
- Following my discovery of the initial correlations of certain health effect/symptom pairings with very specific RF sources in 2021, I took measures to sanitize my environment of RF/EMF, as described in question 3f beginning on pg. 32.
- Numerous, subsequent, singular, accidental or required exposures to the same known RF sources continued to produce the same health effects/symptoms, as documented repeatedly in my log.

Effect/Symptom 1 - 2002

(Cordless Phone Base Station or near-mmWave Cell Tower Transmissions, Cell Phone Signals)

Initial Onset and Timeline

Health Effect/Symptom 1 first manifested in July 2002, approximately 2.5 years following my initial acquisition and usage of a cell phone; and 2 years of teaching in a newer school building, in a windowless high school classroom situated near the physical center of the building.

In September 2003, I taught at a different school, also in a windowless room. Being an older school built in the 1960's, my classroom had thick cinderblock walls.

I estimate at least half the student population at each school regularly brought cell phones to class.

Clinical Details

A medical specialist confirmed a formal clinical diagnosis affecting a specific bodily system, designating the painful condition to be "idiopathic" due to an unknown etiology (the manner of causation). The medical community considers the experience of Effect/Symptom 1 to be a health "condition," not merely a health "effect."

At the same doctor visit whereby I was diagnosed with this health condition (Effect/Symptom 1), I was also diagnosed with two (2) different secondary health *conditions*, both explicitly due to my *chronic* experience of Health Effect/Symptom 1. These two secondary health conditions each alone had the potential to require surgery if I wasn't able to manage and ultimately heal from them. Fortunately, surgical intervention was successfully staved off through *over two (2) years* of conservative treatments, prescribed medications, and strict regimens.

Health Effect/Symptom 1 is without a doubt one of my most painful physiological reactions to RF/EMF, which due to the secondary health conditions that it can cause when it is chronically experienced for a large portion of the day, for days on end with no relief, has the potential to be completely debilitating, and make life very challenging.

Correlation of Effect/Symptom 1 with Specific Locations

The cause (which turned out to be RF/EMF exposure) was unknown in 2002 when I was diagnosed with the health condition (Effect/Symptom 1). I did inform my provider about two locations that were determined to regularly cause an exacerbation of Effect/Symptom 1: my classroom, and my bed. Still, neither I nor my doctor realized the problem could be environmental in nature. We weren't able to determine what could possibly be similar about my classroom and my bed that would cause these to be the locations in which the greatest suffering occurred. Therefore, no troubleshooting of environmental possibilities was ever performed, and it remained a mystery for almost 20 years.

In the two different classrooms at two different schools, the painful symptoms of this health condition (Effect/Symptom 1) immediately worsened during as soon as students started coming in for 1st period, and continued relentlessly all day long, resulting in severe disruption of a "major life activity" as defined under the ADA. When I returned home, after a couple hours, the symptoms diminished or completely went away.

As a teacher with a few solid weeks off during the school year, I would make considerable progress healing the secondary conditions during these vacations: Even in just a week of being away from school, Effect/Symptom 1 would diminish enough that the secondary conditions could start healing. During summer vacation in 2003, I had almost completely healed, but as soon as I returned for the fall school year, Effect/Symptom 1 began in full force and set back all my progress.

During summer vacation of 2004, I was finally able to completely heal both secondary conditions, and I was transferred to the middle school to a room with one wall that was almost entirely windows. I only taught in a windowless room one other school year after that. I did still experience periodic episodes of Effect/Symptom 1, mostly while at school, but fortunately not severely or chronically enough to cause either of the two secondary health conditions again while I was teaching.

In addition to my classrooms, there was also another very specific location in my home in which Effect/Symptom 1 was reliably exacerbated: my bed. Most nights, within just minutes of lying down, it would intensify to the same level as during the teaching day with students in my classroom, making it extremely difficult to fall asleep.

Correlation of Effect/Symptom 1 With a Cell Tower or Cordless Phone Base:

Soon after moving to a new home in 2008, I eventually noticed I wasn't experiencing episodes of Effect/Symptom 1 in bed anymore. I've identified two differences between my bedroom at each house:

1. Although both bedrooms were on the second floor, the newer bedroom was not in the line of sight of a macro cell tower, like my old bedroom was (see pg. 17).
2. I did not use any cordless phones in my new residence because I didn't have a landline—I relied solely on my cell phone for voice calls after 2008. The old bedroom had a cordless phone base and handset a couple feet from my head on the nightstand.

I kept my cell phone downstairs in the kitchen at the both houses. Therefore, the logical explanation for the lack of severe exacerbation of Effect/Symptom 1 in bed as I experienced in the past on a near-daily basis at my former house, is that the environmental stimulus causing it (the cell tower or cordless phone base) was absent from the new house.

Correlation of Effect/Symptom 1 With Cell Phones:

Now that I have done intensive studies of my own health effect/symptom pairings in response to a wide variety of singular, known RF sources, I am absolutely positive that RF/EMF transmissions from cell phones reliably elicit Effect/Symptom 1, with severity dependent upon three variables: duration of exposure, proximity to the cell phone, and type of exposure/signal (voice call or just an idle phone pinging the cell tower periodically).

Following comprehensive RF remediation as detailed in question 3f beginning on pg. 32, I have experienced only a single *chronic* recurrence of Effect/Symptom 1 of sufficient severity to cause one of the two associated secondary health conditions I had in the past to return. This particular 2024 acute flare-up was initiated by an accidental, close-range (within 10-15 feet) exposure of about one (1) minute to a 4G cell phone being actively utilized for a voice call.⁹

⁹ This specific exposure event also concurrently triggered ten (10) separate, documented physiological effects that had previously manifested during past RF/EMF exposures, with onset delays ranging from a few minutes up to 24 hours post-exposure.

This recurrence of one of the secondary health conditions due to Effect/Symptom 1 again becoming chronic following the brief cell phone exposure, required the immediate re-implementation of past conservative therapeutic measures to facilitate healing of the secondary health condition. It ultimately required approximately *four months* of intensive care and management before it completely healed.

In contrast, outdoor exposures of a one-minute duration to cell phones on active voice calls at greater distances, like 50-70 feet away on a neighbor's patio, initiate much lower-intensity instances of Effect/Symptom 1 that begin within about 3-5 minutes, and typically subside within ½ hour to an hour, causing no secondary health conditions to occur.

Consequently, due to my controlled, low-RF/EMF environment, it is easy to identify the precise environmental RF/EMF source causing the onset of Effect/Symptom 1, because it's most often a nearby neighbor actively on a call on their cell phone. It is important to mention that in many cases, *I experience symptoms first*---then I look around for the RF/EMF source. Therefore, it can't be argued that my symptoms are psychosomatic and occurring solely because I'm aware there's an active cell phone nearby.

Now that I have determined an undeniable correlation between the initiation and exacerbation of Effect/Symptom 1 with cell phone RF transmissions, which has repeatedly been reconfirmed countless times during accidental cell phone exposures over the last 5 ½ years, the reason for the intensity and frequency of Effect/Symptom 1 in my windowless classrooms has finally been elucidated:

Cellular phones are engineered to dynamically scale their power output when encountering structural signal blockage. In enclosed, windowless environments near a building's core, devices automatically amplify their radiofrequency signal intensity to establish and maintain a hardware connection with the nearest base station. With an average roster of 30 to 35 students per class period, at least half of whom carried active personal cell phones, the phones within my windowless classrooms would have subjected me (not to mention the vulnerable students, who have thinner skulls and developing brains) to a dense, continuous matrix of elevated radiofrequency microbursts as multiple devices simultaneously amplified their power output to "ping" external communication towers throughout the entire school day.

It is no wonder my health condition (Effect/Symptom 1) was so severely exacerbated during the 2002-2003 and 2003-2004 school years, when I taught in windowless rooms; and I was finally able to achieve complete healing of the secondary health conditions over the 2004 summer vacation. Then, for the 2004-2005 school year, not only did I teach at a different school in room with many windows, it was a *middle* school, where not only my students, but the whole school population had less cell phones in the building than the high-schoolers did. While I did still experience many episodes of Effect/Symptom 1 during the teaching day throughout the rest of my career, I did not suffer any more recurrences of the secondary health conditions until that close-range cell active cell phone exposure in 2024 described above.

Conclusions

My extensive 24 years of experience with Effect/Symptom 1 (a legitimate, medically-diagnosed health condition) and the two secondary legitimate, medically-diagnosed health conditions it causes when experienced chronically, demonstrates that the biological and health effects of environmental RF/EMF sources are not merely transient “discomforts,” but can be long-term, life-altering, severely debilitating health conditions; and even catalysts for the development of further serious health conditions.

Effect/Symptom 2 - 2004

(19.620 GHz Cellular Backhaul Transmitter in 2004, Two Macro Cell Towers in 2020-2021)

Initial Onset and Timeline

Health Effect/Symptom 2 had a sudden onset in the summer of 2004 while residing at my former home where I'd lived since 1994. Like Effect/Symptom 1, this symptom/effect also occurred in very specific locations. I mostly experienced Effect/Symptom 2 either in the driveway near the rear of the residence, or within a single room at the back of the house, which did not make any sense until just recently, after performing some historical research, explained on pg. 17.

Effect/Symptom 2 persisted chronically for the next four years until my relocation to a new home in 2008, at which point I eventually forgot about it, since it completely subsided and remained latent for 12 years.

Effect/Symptom 2 re-emerged in the summer of 2020, coinciding with the time Verizon's 5G had been rolled out in my area (explained on pg. 8), and also around the same time I also started experiencing Effect/Symptom 4 (explained on pg. 22). During this re-emergence phase, Effect/Symptom 2 manifested reliably every time I visited two different nearby parks. I had been to these same parks many times with no ill effects suffered in the past.

By the spring of 2021, when it warmed up and I started visiting the parks more often, Effect/Symptom 2 returned with an even greater severity, encompassing multiple newly-affected anatomical areas than the singular point it affected previously.

Clinical Details

When Effect/Symptom 2 first occurred during 2004-2008, it affected only a highly localized area on my back, approximately the size of a pencil eraser, causing a visible structural change from the surrounding tissue and inducing acute physical sensations and pain. I made a consultation with the appropriate medical specialist for an effect/symptom of this type, but the doctor could not identify the etiology (cause) nor determine a diagnosis.

2020-2021 Causal Factor Identified with RF Testing

By the spring of 2021, it had become undeniable that I was sensitive to RF/EMF in my environment, but I was still trying to live a normal life in society. I continued doing the things I loved, like going out in nature and taking digital photography of flora, fauna and landscapes through the seasons. I took many RF measurements with my GigaHertz Solutions HF-38B at different parks I liked to visit, disheartened to determine how many parks had powerful cell towers on the premises, many which were hidden from view by trees. Once I determined where the cell towers were located, this fact immediately explained the appearance of over a dozen highly specific effects/symptoms I'd experienced *only* while out walking in certain areas of different metroparks, state parks and nature preserves over the previous nine years.

In an effort to isolate the RF/EMF source causing Effect/Symptom 2 once again after its 12-year latency, I performed on-site field testing on several occasions at each of the two parks where it was being reliably experienced. Using the following procedure, I was able to confirm the RF source:

1. I was able to determine that Effect/Symptom 2 manifested with regularity at a particular spot along the trail at each of the two parks, which I marked as a waypoints on my handheld Garmin GPS unit so I would have the exact coordinates.
2. At the point where Effect/Symptom 2 began to manifest, the RF meter's directional antenna, when aimed at the source producing the highest environmental RF/EMF in that location, which was the sound signature of a cell tower, was just beginning to exceed $199.9 \mu\text{W}/\text{m}^2$.¹⁰
3. Back home, examining Google's satellite and street view imagery, I was able to see that each waypoint I'd marked where I had begun to experience Effect/Symptom 2 was almost exactly 0.4 miles away (as the crow flies) from one of two different cell towers.

Establishing this definitive causal link between RF/EMF from cell towers and Effect/Symptom 2 prompted a retrospective investigation into the wireless infrastructure layout surrounding my previous 1994–2008 residence to identify the original 2004 source of Effect/Symptom 2, explained next.

¹⁰ I routinely operate my RF meters on their most granular, high-sensitivity setting, which maintains a maximum saturation threshold of $199.9 \mu\text{W}/\text{m}^2$. The GigaHertz Solutions HF-38B does have an attenuation switch designed to quantify high-intensity fields, but I have rarely used it because my objective was always just to escape sources of RF/EMF that caused health effects/symptoms. All of the effects/symptoms I've ever experienced have occurred at intensity levels lower than $199.9 \mu\text{W}/\text{m}^2$.

2004 Historical Causal Factor Identified Through Record Search

A historical record from a website containing data about antennas brought clarity to the causal factor: the rear orientation of my former house sat in a direct line of sight to a 120.1-foot-tall macro cell tower located 0.5 miles away.

According to the record, the tower supported a directional cellular backhaul microwave transmitter owned by FiberTower, operating at a frequency of 19,620 MHz (19.620 GHz), which approaches the millimeter-wave (mmWave) spectrum.¹¹

A retrospective review of historical Google Street View imagery verified that the tower structure was physically present by July 2007 while Effect/Symptom 2 was actively occurring, which was the furthest chronological limit available for visual review.

Industry documentation indicates that FiberTower initiated this localized microwave backhaul infrastructure in the mid-2000s, establishing a high probability that the tower was erected in the summer of 2004 when Effect/Symptom 2 suddenly began.¹²

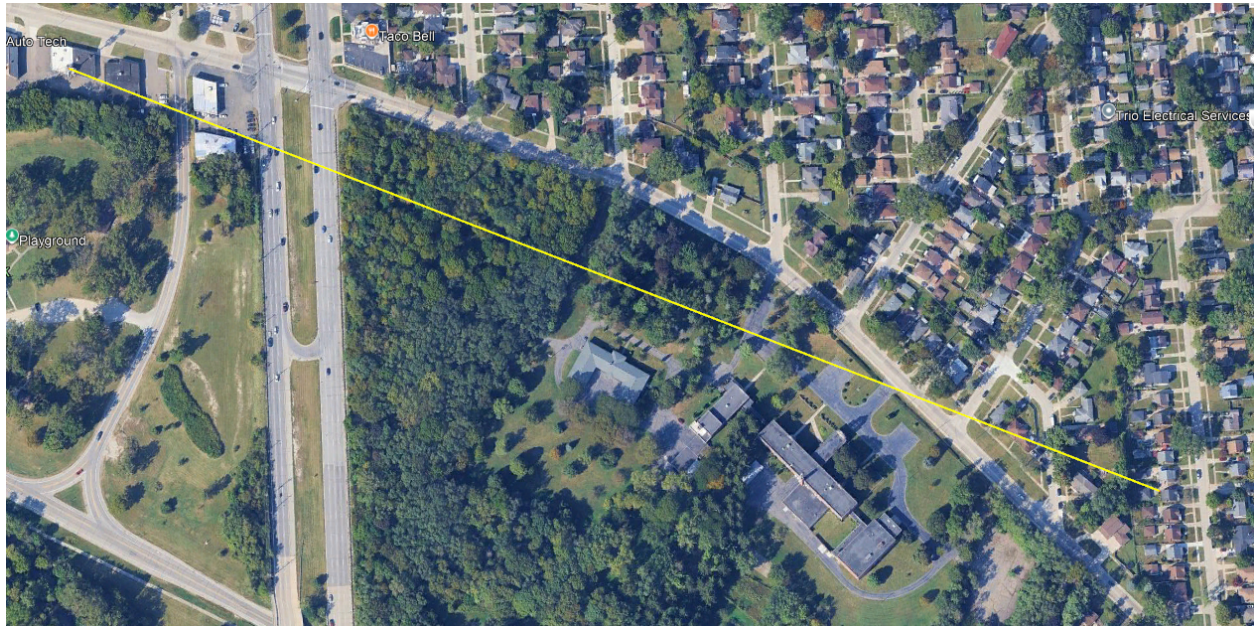
Although active power output intensity data was unavailable within the historical record, and the direction the RF/EMF was being transmitted is unknown, the sudden onset of Effect/Symptom 2 in the summer of 2004 does match the commercial deployment window of this near-mmWave backhaul technology utilized when FiberTower was at its peak.

These legacy transmitters operated as highly-focused, point-to-point links designed to transmit concentrated beams in a specific direction toward a corresponding tower. Because of the resolution constraints of the 2007 Google Street View imagery, I was unable to definitively ascertain if the specific transmitting dishes were oriented directly toward my former residence.

¹¹ It quickly became clear that the record I found represented *historical* operational information for that specific structure, not current. Further research indicated that FiberTower was acquired by AT&T in 2017, meaning the transceiver array has likely been modernized and no longer operates at the legacy 19.620 GHz frequency band utilized during my original 2004–2008 exposure window. In contemporary telecommunications architecture, the vast majority of macro cell towers now rely on physical fiber-optic cabling networks for high-capacity backhaul data routing, rather than utilizing highly directional, over-the-air microwave point-to-point links like the legacy FiberTower infrastructure did.

¹² Public federal build-date records were unavailable via the FCC's Antenna Structure Registration (ASR) database because the structure stood under the 200-foot threshold that mandates federal registration.

Below is a satellite image from Google Earth showing the location of the cell tower on the left and a yellow line drawn to the rear of my former house on the right:



Conclusions

Knowing the tower was there at my former residence, operating in a *near-mmWave* frequency is highly illuminating:

I'll never forget the worst experience I had at my former house with Effect/Symptom 2: On August 15, 2004, I was trying to take photos of a praying mantis on a lily near the driveway at the back of the house. I experienced Effect/Symptom 2 so severely that I couldn't even hold up the camera, and I had to quit the photo shoot early. This was the episode that prompted me to consult with a medical specialist, who as explained, had no answers. I have now determined that my back (the part of my body that was affected by the pencil eraser-sized spot in which Effect/Symptom 2 manifested) had been facing the tower the whole time while taking those pictures.

The tower's presence would also explain why I experienced Effect/Symptom 2 regularly when sitting in the room at the rear of the house. The only two seating areas I used in that room also maintained my back facing the tower, as they were both positioned with the seat backs right against the rear wall of the home.

Also of tremendous importance to this study is the fact that mmWave technology was rolled out in my area in July 2020, with Verizon's 5G. This time period coincided *exactly* with the re-appearance of Effect/Symptom 2 at the parks that I found to be in close proximity to macro cell towers (within 0.4 miles or less). Effect/Symptom 2 had been absent for 12 years since I moved to my new home in 2008. It suddenly appeared in 2004 (likely coinciding with tower installation), and it suddenly appeared when 5G

antennas were known to have been installed on the macro cell towers in 2020 in the surrounding areas near my current house (from Verizon's website's 5G progress map).¹³ By spring 2021, my exposures since July 2020 had become more severe both in intensity as well as in the number of areas of my body that were affected.

Given they have the propensity to produce such immediate-onset, intense health effects/symptoms, I believe these highly energetic waves in the near-mm and mmWave frequencies will definitely require exposure limits to be set far lower than mid-band frequencies.

It is very possible that perhaps these frequencies cause too intense of vibrations within humans and other living organisms, and are therefore too dangerous to be used at all. 5G was never studied for its biological or health effects before its roll-out. Refer to the Swedish case study on pg. 72, documenting that 5G signals contributed to rapid physiological degradation in seven different people after deployment.

Effect/Symptom 3- 2012

(Macro Cellular Infrastructure (while outdoors only), Utility Mesh Network Smart Electric Meter's Router on Neighbor's Home, Wireless Doorbell, and Emergency Vehicle Transponders)

Initial Onset and Timeline

Effect/Symptom 3 first manifested in 2012 as an anomalous, localized health effect. It was first noticed while walking in public parks, most of them situated within a 5- to 55-mile radius of my residence. I experienced it periodically throughout the forthcoming years, and was always outside when it happened.

During the summer of 2020, Effect/Symptom 3 became much more prevalent, continuing to manifest exclusively outdoors, both at my home and other locations away from my residence.

Since the extensive lifestyle changes and RF remediation performed as described in question 3f beginning on pg. 32, the last time to date that I experienced Effect/Symptom 3 was the June 2024 exposure to radio transmitters on an Emergency Medical Services vehicle, explained below.

Clinical Details

Effect/Symptom 3 presented as a musculoskeletal anomaly. When chronic, it resulted in a severe disruption of a "major life activity" as defined under the ADA. The frequency of Effect/Symptom 3 was completely non-cyclical and non-autonomous. I found that it directly mirrored the presence of levels of environmental RF exceeding 100 $\mu\text{W}/\text{m}^2$,

¹³ Unfortunately, the mmWave RF tester by Safe Living Technologies was not available until 2024, so I could not verify that mmWaves were radiating from the two cell towers in 2020 or 2021. I have not visited these parks again to do any further testing.

commencing within seconds to approximately three minutes after entering active RF fields of this intensity or greater. The acute painful sensations following a brief exposure would completely subside within minutes to an hour by escaping the source. However, if the exposure event was prolonged, secondary health conditions ensued which caused further pain, and disruption of the same major life activity, sometimes lasting for several days.

Because this specific musculoskeletal area had been diagnostically documented to have been previously injured in a 2010 motor vehicle accident, both my treating clinicians and I naturally but incorrectly attributed the new issue entirely to permanent trauma from the auto accident.

The true environmental RF/EMF sources of this pathology went completely unrecognized until February 2021. Using my GigaHertz Solutions HF-38B RF meter, I was able to systematically measure and correlate the EMF/RF in my environment directly with the onset of this very particular effect/symptom.

Four Causal Factors Identified With RF Testing

Though the use of the GigaHertz Solutions HF-38B RF, in the spring of 2021, I was able to finally trace this musculoskeletal symptom to three distinct sources of anthropogenic RF/EMF.

Using my Safe and Sound Classic II RF meter by Safe Living Technologies, in June 2024, I determined a fourth source that also elicited Effect/Symptom 3.

Below are descriptions of four RF sources known to elicit Effect/Symptom 3:

1. Macro Cellular Infrastructure:

In March 2021, field testing while walking at a metropark, I confirmed a definitive correlation between macro cell tower RF/EMF and Effect/Symptom 3.

Approaching within approximately 0.3 miles of a known macro cell tower structure, marked on my Garmin GPS from satellite imagery viewed at home (although blocked from view by trees while out in the field), the directional antenna logged a power density just greater than $199.99 \mu\text{W}/\text{m}^2$. At this point, I instantly began to experience Effect/Symptom 3. The effect/symptom subsided only after physically retreating in the opposite direction, confirmed by a decrease of intensity measured on the RF meter.

Remarkably, during this exposure event, my walking companion concurrently experienced localized physical pain in the exact same musculoskeletal area affecting me, despite maintaining a completely different medical history and no prior injuries to that particular body part! Because a similar structural pathology was simultaneously triggered across two separate individuals under identical environmental parameters, it entirely eliminates psychosomatic suggestion and

anticipatory anxiety as causal variables, as well as any chance Effect/Symptom 3 could have been a direct result of a previous injury to that location.

2. Utility Mesh Network Smart Electric Meter's Router: I was able to isolate a regional router/collector inside the smart electric meter on my neighbor's house, situated directly across from my kitchen window as a primary environmental trigger for Effect/Symptom 3. The definitive linking of Effect/Symptom 3 to this specific smart electric meter's router's RF emissions was validated across two distinct chronological exposure events:

April 23, 2021: While measuring emissions from the smart electric meter's router on my neighbor's home while walking toward the meter, the moment my RF meter hovered around $185 \mu\text{W}/\text{m}^2$ near my property's boundary, Effect/Symptom 3 recurred near-instantaneously in conjunction with three other effects/symptoms, one of which was Effect/Symptom 4, appearing on pg. 22.

May 7, 2021: While briefly (less than 30 seconds) stepping out from behind my RF shielding panels which were specifically installed to attenuate this smart electric meter's router's RF emissions, Effect/Symptom 3 was immediately elicited as soon as I was in the line of sight of the smart meter.

3. Wireless Doorbell: On April 25, 2021, I was conducting outdoor testing at a residence other than my home, testing a different smart meter in my same township other than my immediate neighbors'. However, within about a minute of exiting my car, I started experiencing Effect/Symptom 3. I swept the area with my directional antenna. Having tested this specific residence for outdoor RF sources before, I immediately noticed a new localized signal across the street from the test residence measuring $\sim 10 \mu\text{W}/\text{m}^2$. The homeowner told me that particular neighbor had just recently installed a wireless doorbell. Effect/Symptom 3 quickly dissipated as soon as I went behind the test residence, where the doorbell's signal was obstructed.
4. Emergency Medical Services vehicle RF/EMF Exposure Event: In June 2024, an Emergency Medical Services vehicle pulled up in front of my home, remaining present for approximately 40 minutes. Standing outdoors in my shielded yard *behind* my house, measured on Google Earth to be 85 feet from the EMS vehicle parked in the street out front, I could hear the vehicle's active RF antennas broadcasting "sounds" registered on the RF meter that I'd never heard before while testing environmental RF. These registered pulses fluctuated between 100-1000 and 1000-10,000 $\mu\text{W}/\text{m}^2$ on my RF meter; and induced an acute, painful recurrence of Effect/Symptom 3, which resolved within about an hour after the vehicle departed the area.¹⁴ Other health effects/symptoms I had

¹⁴ For this unplanned field tracking event, measurements were logged utilizing a consumer-grade Safe and Sound Classic II broadband RF meter from Safe Living Technologies. This specific instrument is engineered to display environmental power density within distinct, standardized threshold bands (such as 100 to $<1,000 \mu\text{W}/\text{m}^2$ or $1,000$

experienced before from other known sources of RF/EMF were also experienced in response to this EMS vehicle's RF transponders.

Conclusions

Exposure to very specific sources of RF/EMF was directly correlated with the onset of Effect/Symptom 3. The fact that the symptom resolved as soon as I moved away from the RF source was further proof of this connection. When I stayed inside the protected, shielded areas of my home and yard, I did not experience *any* instances of Effect/Symptom 3.

It is worth noting that I have never had a single occurrence of Effect/Symptom 3 *indoors*, ever, even *before* I installed RF shielding. It is also worth noting that Effect/Symptom 3 became more prevalent in the summer of 2020, coinciding with the roll-out of 5G by Verizon, similarly to Effects/Symptoms 2 (pg. 15) and 4, discussed on this page below.

Health Effect/Symptom 3 was especially remarkable due to its presentation as an acute, seemingly structural impairment that severely compromised a major life activity when present. The condition was characterized by a rapid onset and resolution cycle—a volatility unexpected for an issue appearing to be structural in nature—yet it certainly resulted in profound disruption when present.

Unfortunately, individuals continuously confined to high-density RF/EMF environments are effectively deprived of a baseline—they may never discover that complete symptom resolution is possible if only they could escape the ubiquitous RF/EMF exposures. I sure am thankful I was able to correlate distinct sources of RF with Effect/Symptom 3's onset so I can continue to prevent this painful and disabling effect/symptom from recurrence.

Effect/Symptom 4 - 2020

(5G Cellular Antenna Transmissions and 4G/5G Cell Phones)

Initial Onset and Timeline

Effect/Symptom 4 began suddenly in the summer of 2020, similarly to Effects/Symptoms 2 and 3, coinciding with the initial commercial deployment of 5G infrastructure in my suburban residential area.

For months, Effect/Symptom 4 was reliably triggered every single time I stepped outside of my house (particularly into the *front* yard), or tried to go for my regular neighborhood walk. Its onset was near-instantaneous, typically manifesting within only about a minute or two of leaving my home.

to <10,000 $\mu\text{W}/\text{m}^2$) rather than displaying granular numeric integers, which explains the broad volumetric parameters of the recorded exposure data listed above.

Effect/Symptom 4 continued to be experienced so intensely that by the end of August 2020, I had to abandon the daily walks I diligently completed for over a decade, and purchase a treadmill in order to be able to get some exercise indoors.¹⁵

Effect/Symptom 4 has decreased in prevalence since 2021, following the extensive lifestyle changes and RF mitigation performed, as described in question 3f on pg. 32. However, to this day, I continue to notice correlations between the appearance of Effect/Symptom 4 and known exposures to 5G network signals entering my home and property boundaries (heard on RF meters).¹⁶ I have also noticed Effect/Symptom 4's occurrence after singular, accidental exposures to a neighbor's 5G phone while they are actively on a voice or video call.

Clinical Details

Effect/Symptom 4 is profoundly debilitating, carrying severe systemic health risks that have the clear potential to be life-threatening, as well as life-shortening if it is experienced chronically. When triggered, Effect/Symptom 4 severely restricts my functional capacity and creates near-instantaneous physical distress that would be clearly obvious to a bystander.

Similarly to Effect/Symptom 1, Effect/Symptom 4 isn't just a minor annoyance or pain—it is considered to be a serious, chronic health condition by the medical community. Leading global health organizations—including the World Health Organization (WHO) and the Mayo Clinic—classify it as a “major non-communicable disease that requires careful, ongoing management.” It has the potential to be life-threatening, impacting major life activities. It can even result in permanent damage to the structures involved if this effect/symptom is experienced chronically, like it was for me, and would have continued to be, had I not realized Effect/Symptom 4's connection to RF/EMF exposure. Now, the protective measures I've implemented, described in question 3f on pg. 32 make a dramatic difference in the prevention of its occurrence.

The frequency of this symptom is non-cyclical and appears to be directly correlated with known exposures to RF/EMF sources, particularly 5G cell tower transmissions and 4G/5G cellular devices. The duration of an individual episode depends primarily on the duration of exposure. If I remain exposed to the source, the symptom continues

¹⁵ Unfortunately, it took near-daily use of the treadmill before I finally discovered on May 24, 2021, that it was constantly broadcasting a Bluetooth signal measuring over 199.9 microwatts per square meter ($\mu\text{W}/\text{m}^2$). By May 28th, after obtaining a hidden button combination from the tech support department, I was able to access the administrative menu and permanently turn the Bluetooth off. A completely *different* health effect/symptom (not one of the five identified in this comment) I experienced every time I used the treadmill completely disappeared after this deactivation of Bluetooth. I had originally blamed that specific effect/symptom on a separate medical condition I was diagnosed with, but it turned out, they had nothing to do with one another. The Bluetooth signal alone was causing this specific health effect/symptom.

¹⁶ As explained on pg. 8 in the 2020 5G roll-out section, I can identify the sound of one of the newer mid-band 5G signals on the RF meter when it is periodically present in my home and on my property from my neighbor's cell phone use. My RF shielding primarily functions to block emissions from the neighbors' smart meters and wi-fi. Signals from higher above, like the 5G cell towers and masts are not attenuated.

indefinitely. Following a physical retreat into a shielded or reduced-RF area, Effect/Symptom 4 typically completely subsides within minutes to hours. A similar pattern was experienced in January 2021 when a cell phone was brought into my residence and then removed.

Causal Factors of Initial Onset of Effect/Symptom 4

Given its sudden onset in the summer of 2020, Effect/Symptom 4 appears to be correlated with the new 5G signals that appeared in my environment at that time due to the rollout of 5G by Verizon in my area. It seems to have also caused me to become sensitive to 4G phones, which I previously had no issues with.

The sudden emergence of an entirely new symptom that appears to coincide with the 5G rollout, certainly *does* align with established biophysical research regarding signal architecture:

Studies indicate that highly complex, heavily modulated, and pulsed artificial frequencies—such as the advanced beamforming and orthogonal frequency-division multiplexing (OFDM) utilized in 5G—are significantly more biologically active than older, simpler transmission protocols. As detailed in the 2025 comprehensive biophysical mechanism study entitled *A comprehensive mechanism of biological and health effects of anthropogenic extremely low frequency and wireless communication electromagnetic fields*, man-made wireless communication fields are polarized and highly variable, which forces irregular oscillations within voltage-gated ion channels and triggers *non-thermal* cellular stress.¹⁷

Direct Link of Effect/Symptom 4 to a 4G Cell Phone

While I continue to have experiences of Effect/Symptom 4 from known 5G cellular antenna transmissions and accidental exposures to both 4G and 5G phones, below is an explanation of the first time (January 2021) I was able to finally link my experience of Effect/Symptom 4 directly to RF transmissions through a structured tracking protocol involving a visitor who regularly carried their 4G smartphone into my home before I discovered I was sensitive to the phone's RF emissions.

Like clockwork, within approximately 40 minutes of this visitor entering my house, Effect/Symptom 4 would manifest. After they left, this effect/symptom would be gone within about an hour. Additionally, Effect/Symptom 5 (explained on pg. 26) also occurred with this visitor's presence like clockwork, but began within only five (5) minutes. Neither of us could determine at first why either of these unusual health effects, clearly observable to this visitor, were suddenly happening to me. This visitor had been to my home *countless* times with no such effects.

¹⁷ Panagopoulos, D. J., Yakymenko, I., De Iuliis, G. N., & Chrousos, G. P. (2025). A comprehensive mechanism of biological and health effects of anthropogenic extremely low frequency and wireless communication electromagnetic fields. *Frontiers in Public Health*, 13, 1585441. PubMed Central. <https://doi.org/10.3389/fpubh.2025.1585441>

Based on the physical characteristics of Effect/Symptom 4, and what I thought I knew about this well-known health condition, I logically assumed whatever was causing Effect/Symptom 4 necessarily had to be a substance this visitor had on their person that was now in the indoor air of my home. Fortunately, they graciously eliminated their personal products one by one before each subsequent visit until they had replaced everything they normally used with my provided substitutes that I knew for certain did not elicit any allergic reactions.

Effect/Symptom 4 was *still* unchanged after the visitor had switched to using all of my own personal care products for their needs (laundry detergent, hand soap, dish soap, bar soap, and shampoo). Effect/Symptom 4 still appeared like clockwork within 40 minutes of the visitor's arrival, Effect/Symptom 5 still appeared like clockwork after 5 minutes, and there were no other products this person used that we needed to switch out.

At this point, I had already begun to experience Effect/Symptom 5 in response to other RF sources (which was clearly electromagnetic in nature, as explained below in its own section), but I *never* suspected it was possible for Effect/Symptom 4 to be caused by RF exposures. As a final attempt at determining what was causing me to react to their presence, the visitor tried leaving their cell phone in the car. This resulted in the immediate discontinuation of both Effects/Symptoms 4 *and* 5 when this person visited going forward and followed that procedure.

Conclusions

I hypothesize that the 40-minute delay in onset of Effect/Symptom 4 from exposure to a single 4G phone is likely because the device sat idle, meaning I was primarily exposed only to its periodic, lower-power background "pings" to the cell tower.

When the 5G signal, directly beamed from the cellular antenna to a neighbor's 5G phone which is actively being used, also passes into my home, the onset of Effect/Symptom 5 occurs within minutes, and generally takes no more than about ½ hour to resolve following the signal's disappearance (confirmed with an RF meter).

Effect/Symptom 4 was highly unusual in that it presented as an effect/symptom normally known to be initiated by a chemical or other particulate matter in the air, which was why at first, I suspected it had to be something on my visitor's body or clothing causing this serious health condition.

All general practitioners need to understand that people can experience health effects and health conditions, each with associated symptoms, from exposure to RF/EMF that *precisely mimic* an exposure to a chemical or other physical particle in the air.

Effect/Symptom 5 – 2021 (The “Eureka Moment”)

(Peach Mountain Radio Telescope, Wi-Fi Printer, 4G Cell Phone, Smart Electric Meter’s Router on Neighbor’s Home, Wireless Infrastructure at Traffic Intersections, Cell Towers)

Initial Onset and Timeline

Effect/Symptom 5 first manifested in winter 2020 as a localized involuntary neuromuscular reaction, occurring nearly every time I paused in specific locations of the house, many of which I began to notice were near windows. Effect/Symptom 5 was also being triggered away from home while waiting at very specific traffic intersections; and certain roadways, particularly expressways.

The definitive turning point occurred on Sunday, January 31, 2021, the day following a visit to Stinchfield Woods, the park surrounding the Peach Mountain Radio Telescope. Six prior visits to this park beginning in the summer of 2019 occurred without incident, possibly because the telescope was not actively transmitting during those specific visits, or possibly because I became more sensitive due to the new 5G exposures I’d been subjected to since July 2020. While I had already been experiencing transient occurrences of Effect/Symptom 5 throughout the day on January 30th, before, during and after my visit to Stinchfield Woods; by January 31st, the experience of Effect/Symptom 5 had escalated into an intense, nearly non-stop involuntary neuromuscular reaction throughout the remainder of the day and night, causing the localized tissues to severely ache. By the early morning of February 2, 2021, the continuous mechanical contraction of the tissue was so profound that visible, purplish bruises had formed in that area!

This extreme exposure event served as the primary catalyst for connecting my physical symptoms directly to ambient radiofrequency (RF) fields, which is why I refer to it as my “Eureka Moment”. It prompted immediate scientific research into the topic of health effects correlated with exposure to electromagnetic radiation, and the purchase of my first calibrated RF meter (a Gigahertz Solutions HF-38B) on February 3, 2021.

The last recorded instance of Effect/Symptom 5 to date occurred on Sunday, May 12, 2024, when it was acutely triggered by 5G signals from either a neighbor’s phone itself and/or the antenna’s beam focused on the phone extending onto my property. It was visible to me that the neighbor was actively on either a voice or video call about 40 feet away from my outdoor location when I experienced Effect/Symptom 5.

Clinical Details

Effect/Symptom 5 presented as acute, localized, involuntary neuromuscular reaction, with sensations initially manifesting as a distinct physical “buzz” resembling an electrical shock similar to the feeling of accidentally touching a live wire in a house, only milder. Later sensations were not as intense, and were felt as more of a “twitch” than a “buzz.”

Effect/Symptom 5 was clearly and unambiguously tied to several distinct RF sources, as explained below.

Causal Factors and Verification of Causality

In addition to the foundational connection established by the Peach Mountain Radio Telescope exposure described above, a series of other investigations were conducted between January 26 and January 31, 2021. I verified a direct causal link between Effect/Symptom 5 and each of the following consumer technologies:

1. Wi-Fi Printer: My investigation began on January 26, 2021 when my local wireless network, wireless printer, and wireless scanner were entirely deactivated. This internal sanitization eliminated Effect/Symptom 5 from occurring regularly at the bottom of the basement stairs where the printer's Wi-Fi module had been broadcasting, and I never experienced it again in that location, leaving no doubt the Wi-Fi from the printer had been eliciting Effect/Symptom 5.
2. 4G Cell Phones: In January 2021, Effect/Symptom 5 continued to trigger like clockwork within five minutes of a particular visitor entering the home. The section above titled "Direct Link of Effect/Symptom 4 to a 4G Cell Phone" on pg. 24 explains this situation, and the testing protocols implemented that eventually confirmed that RF/EMF emissions from a 4G phone were directly eliciting both Effects/Symptoms 4 and 5.

Effect/Symptom 5 was also triggered by another accidental 4G cell phone exposure on April 16, 2021 whereby a different visitor accidentally brought their 4G cell phone into my house.

3. Router Inside Neighbor's Smart Electric Meter: Using my RF meter, I had determined that a high-powered regional mesh network router was housed inside the neighbor's smart electric meter. Its strongest beam of RF was directed right at my southern kitchen window. The router signal was broadcasting continuously, registering over 199.9 $\mu\text{W}/\text{m}^2$ as measured at my property boundaries, and approximately 30 $\mu\text{W}/\text{m}^2$ as measured through the glass of that kitchen window. Standing in front of this window or stepping onto the outdoor patio, both locations within clear, head-on sight of this neighbor's smart electric meter containing the router, instantly and routinely elicited Effect/Symptom 5.

To mitigate the high-intensity router signal, specialized RF-attenuating aluminum mesh panels were installed in the path of the smart electric meter's primary, straight-forward transmission beam.¹⁸ The mesh panels successfully dropped

¹⁸ The brand of smart meters on the homes in my community also broadcast RF from both *sides* of the meter, in addition to its strongest, front-facing beam, as indicated within manufacturer's white papers. Its side-pointing beams can be strongly detected by my RF meter while in the electric meter's sight lines in the front and south side of my home.

Because additional shielding would compromise the *front* aesthetics of my home, my neighbor's smart electric meter has effectively stripped away the use, enjoyment, and ability to maintain my property. I can no longer care for part of my front yard or the entire south side of my home, forcing me to hire out standard yard work. Even retrieving mail from the communal mailbox on the corner elicits multiple health effects/symptoms; though it is only one house away, walking there forces me to pass through the meter's side-facing RF emissions, twice.

the incoming RF from the smart meter's router from over 199.9 $\mu\text{W}/\text{m}^2$ down to $\sim 5 \mu\text{W}/\text{m}^2$ as measured from behind the mesh. Following this attenuation, the acute involuntary neuromuscular reaction completely ceased while standing behind the protected boundary in the yard, as well as while positioned at the kitchen window.

4. Municipal wireless traffic-light camera sensors and intersection masts: After learning to identify the visual appearance of various common transmitters in a city environment, I was able to detect localized municipal infrastructure, including active traffic-light camera sensors and intersection communication masts at the very intersections at which I was previously experiencing Effect/Symptom 5. This visual verification explained why I had been experiencing this effect/symptom during winter 2020 at very specific intersections and roadways.
5. Cell Towers: I studied the placement of cell towers on some of the common expressways I traveled, and determined at least two of the memorable landmark locations in which I had experienced Effect/Symptom 5 repeatedly were in close proximity to cell towers adjacent to the highway at those points, which explains the appearance of this effect/symptom in those locations during winter 2020.

Conclusions

Subsequent exposures to cell phones since spring 2021 have all been accidental, occurred without the presence of a monitoring RF meter, and were quickly remediated to prevent health symptoms/effects from occurring or worsening. Therefore, I do not know the intensity of the RF emissions that elicited Effect/Symptom 5.

Considering Effect/Symptom 5 commenced within about 5 minutes with each exposure to a 4G phone that wasn't even being used for a call or to transmit data, it is highly possible that just one single "ping" to the cell tower(s) may have been causing Effect/Symptom 5, but I can't be certain how many pings took place before I felt the symptom because I didn't yet own an RF meter when I made the initial discoveries in January 2021.

Concluding Remarks about Effects/Symptoms 1 – 5

In summary, my 24-year history of tracking health effects, health conditions, and symptoms; combined with the ability to query my extensive log of experiences using LLMs, provides a clear, documented timeline of how cumulative environmental radiation systematically erodes human physiological resilience. My experience is not an isolated anomaly; rather, it mirrors the progressive rollouts of increasingly powerful and biologically active wireless technologies over the past two decades.

As I have demonstrated with the five Effect/Symptom studies just presented, it is certainly not easy to confirm a sensitivity to RF/EMF, and it can go unsuspected for years, if not one's entire life, since the medical community continues to be mostly

uninformed that health effects/symptoms can occur in response to exposure to anthropogenic RF/EMF. Most people that do discover their sensitivity have determined it completely on their own. Specialized RF meters are required for a truly objective study, like those I presented above.

Most importantly, one must first and foremost, have the actual *thought* that one should test for RF electromagnetic radiation in their environment, which is a rarity, given the general acceptance level that wireless devices have achieved over the years. Most people don't even remember all the talk of health concerns about cell phones back in the early 1990s, about a decade before they started to gain popularity.

It is remarkable to note that I have experienced numerous documented effect/symptom pairings in response to singular, known cell phone exposures. Using an LLM to query my log, 26 different symptoms were retrieved that I've described in response to *singular* known accidental exposures to a cell phone (and there may be more upon performing standardization of effect/symptom terms and re-analyzing). Cell phones are simply one of the most, if not *the* most powerful RF-emitting device present within the average person's home (and they are usually carried on one's person).

The trajectory of my health degradation and partial symptomatic resolution following RF remediation yields three undeniable conclusions for regulatory bodies:

1. Exposure to RF/EMF can induce serious health conditions:

The biological and health effects correlated with exposure to RF/EMF are not simply minor annoyances. For example, Symptoms 1 and 4 are considered by the medical community to be "health conditions" with the possibility of serious, life-altering or life-threatening complications.¹⁹

2. Symptoms progress over time:

Although individual symptoms may have occurred soon after a new RF/EMF exposure source was introduced, my overall hypersensitivity to countless RF/EMF sources did not appear overnight. It was driven by clear, identifiable milestones: the initial acquisition of a cell phone in 1999; a new cell tower emitting near-millimeter 19 GHz waves in 2004; the industrial smart meter installation in 2013, resulting in a high-powered router blasting right at my home's kitchen window by my sink 24/7, and another smart meter emitting RF into the adjacent corner kitchen window; and finally, the complex signal modulation of the 5G rollout in 2020.

¹⁹ Symptoms 1 and 4 are not the only symptoms I experience unanimously considered by the medical community to be serious, life-altering or life-threatening health *conditions*, rather than mere "effects."

3. Causality is conclusively proven via remediation:

Skeptics often dismiss Electromagnetic Hypersensitivity (EHS) as psychological or "idiopathic." However, the fact that chronic, multi-year symptoms/effects improved or completely vanished within hours to days of my 2021 RF remediation, as explained in further detail below, definitively proves causality.

The subsequent return of Effects/Symptoms 1 and 4 *only* during accidental or required exposures; and the continued absence to date of Symptoms 2, 3, and 5, completely satisfies the scientific criteria for environmental poisoning and recovery.

e. Whether medical evaluation or treatment was sought, including any diagnoses received (if the respondent chooses to share them).

As explained in the Clinical Details sections for Effects/Symptoms 1 and 2 on pgs. 11 and 15, respectively, I saw two different specialists for these two completely unrelated symptoms.

Effect/Symptom 1 was diagnosed to be a medically-acknowledged health condition, which directly contributed to the acquisition of two other health conditions, diagnosed at the same time, which required *over two years* from which to heal.

The specialist I saw for Effect/Symptom 2 was unable to make a diagnosis.

Also as explained in the Clinical Details section of Effect/Symptom 3, on pg. 19, this effect/symptom was thought by my practitioners to be a result of my auto accident, since it sounded like I was experiencing effects from a *structural* injury. Note that I didn't make any practitioner visits *specific* to Effect/Symptom 3. I could only describe it to my practitioners because it never happened at any scheduled visits, so they couldn't observe it first-hand. I know now why it never happened in their offices: the specific RF sources I have now documented to elicit this highly specific health effect/symptom would most likely not have been present inside a doctor's examination room in a hospital (Macro Cellular Infrastructure (while outdoors only), Utility Mesh Network Smart Electric Meter's Router on Neighbor's Home, Wireless Doorbell, and Emergency Vehicle Transponders²⁰).

²⁰ These buildings were not hospitals that handled emergencies, so there would not have been any EMS vehicles present on the premises.

The difficulty in obtaining accurate clinical guidance for people suffering health effects/symptoms of EHS highlights three severe systemic deficiencies within our current healthcare infrastructure:

1. Extreme Scarcity of Environmental Specialists:

Nationwide, practitioners who understand Electromagnetic Hypersensitivity (EHS), or who are even aware of the fact that exposure to RF/EMF is correlated with biological and health effects/symptoms and conditions, are exceedingly rare.

If a person does encounter a practitioner who recognizes they may be suffering from a sensitivity to wireless radiation (RF/EMF), the practitioner likely won't be equipped to treat the condition, nor will they be able to offer a referral to a nearby environmental specialist.

There is a near-total absence of clinical specialists trained in environmental illness at the local level. I am aware only of a few specialized clinics in California, Texas and South Carolina that openly disclose EHS as a condition they treat. With travel being difficult, if not nearly impossible for people with EHS, these clinics are out of reach unless a person happens to live right near one.

2. Lack of Standardized Medical Protocol:

Because major health agencies do not officially recognize the *non-thermal* biological impacts of exposure to RF/EMF, there are currently no standardized, universally accepted clinical treatments available for EHS. Patients are left entirely on their own to research, fund, and implement environmental remediation strategies, some of which are shams, due to lack of regulation of EMF shielding and protective products, as explained on pg. 54).

In some instances, identifying an environmental pathology should be a straightforward diagnostic process. For example, when a patient informs their physician that severe neuromuscular reactions consistently worsen the exact moment they lie down to sleep (a period that for most people, naturally induces physiological relaxation); or that distinct localized symptoms occur exclusively within a specific driveway area and a single room, both at the rear of the house, the clear spatial patterns I experienced with Symptoms 1 and 2, respectively, these circumstances should immediately flag an *environmental* trigger.

3. Absence of a Causal Screening Framework:

The fundamental problem is that modern medical professionals are simply not trained to cross-examine a patient's physical symptoms with their technological environment. A simple questionnaire about one's technology use and devices present could assist in diagnosing a sensitivity to RF/EMF.

Because exposure to RF/EMF can potentially affect every single bodily system imaginable, all health practitioners in all fields should have consumer-grade RF testers available for immediate loan following an appointment. When an environmental cause of pathology is suspected (i.e. due to the questionnaire results), the RF tester can be sent home with the patient. They can test their surroundings, documenting the intensities, locations and devices they measured, and return with their findings on their next visit.

f. Whether steps to reduce or eliminate exposure were taken and, if so, whether any subsequent changes in potential adverse health effects were observed.

As soon as it became undeniable that I was sensitive to RF/EMF, I began taking steps to lessen my exposure by eliminating everything wireless I had in my home, as explained below.

By mid-April 2021, I had implemented all parts of the following remediation protocol:

Elimination of All Wireless Technology Within My Home

- Eliminated Wi-Fi in my home by disabling the router signals on the combo modem/router from my cable company (January 26, 2021)
- Connected my PC to the internet with an Ethernet cable, and disabled Wi-Fi and Bluetooth on both my PC and laptop (January 26, 2021)
- Disabled my wireless printer and scanner and connected them to the PC via USB cables (January 26, 2021)
- Switched to wired keyboard and mouse for my PC (February, 2021)
- Discontinued cell phone usage and restricted mobile devices from entering my home (April 2021)
- Transitioned from my Bluetooth headset to a POTS landline corded phone used only on speakerphone (April 2021)
- Purchased a wired microphone for use with dictation instead of the Bluetooth headset (April 2021)
- Disabled Bluetooth in my vehicle (April 2021)

When trying to eliminate wireless devices within a home, it is imperative to *continue* testing the house with an RF meter—at least a consumer-grade model that captures standard household frequencies—even when one believes everything wireless in the house has been found. A highly effective strategy is to simply leave the RF meter

running nearby while going about one's day to listen for any loud, unexplained signals clearly originating from *inside* the house.

The value of this approach becomes clear when discovering hidden transmissions, like I did. I was surprised to find a periodic RF pulse from an older computer, even *after* turning off both the Wi-Fi and Bluetooth settings in its operating system, and hearing on the RF meter that those signals ceased broadcasting. Apparently, the hardware can still broadcast a signal periodically even with Wi-Fi and Bluetooth turned off. In such cases, one must enter the computer's BIOS and disable the wireless card to stop the transmissions. Constant vigilance and active metering are the only ways to ensure a home is truly cleared of RF/EMF.

Once the inside of the home is cleared of wireless transmitters, then it's time to use the RF meters to locate external sources that are high enough to attenuate. In my case, it was my two neighbor's smart electric meters, each of which was emitting RF into a different one of my corner kitchen windows.

Further Testing Protocols and Modifications

- Disabled Bluetooth transmitter on treadmill purchased in August 2020, which in late May 2021, was determined to have been emitting continuous RF/EMF during treadmill use, even though no device was ever paired/synced to it (May 28, 2021)²¹
- Installed panels of high-attenuation, specialized RF-shielding aluminum mesh both inside and outside my property to attenuate the strongest environmental signals from wireless infrastructure and neighboring properties' wireless devices (February through June 2021)
- Relocated my bed to the finished basement after having systematically mapped the multi-level radiofrequency gradients within my home, determining that this location consistently had the lowest levels of all testable frequencies of RF (March 14, 2021)

Empirical measurements confirmed that the basement bedroom relocation reduced my exposure levels to approximately one-half (50%) of the intensity found on the main floor, and down to a remarkable one-eighth (12.5%) of the exposure intensities documented on the second floor where my bedroom had been originally situated.

²¹ Despite numerous home sweeps with the RF meter, I still managed to overlook the treadmill's Bluetooth transmitter because I failed to ever turn on the RF tester while the treadmill was *in use*. I wrongly assumed that if I never used the Bluetooth, and never paired anything, that it wouldn't be transmitting RF, so I never gave it any thought. Its Bluetooth pulses were continuous, measuring higher than the sensitivity to which my meter was set, 199.9 $\mu\text{W}/\text{m}^2$. Unfortunately, many wireless consumer devices operate this way, with an always-on wireless card.

Another benefit of the basement bedroom location is that I am able to place my bed in an area where my head is at least 10 feet from any wall containing electrical wiring, which is impossible in any other room of my house.

- Maintained near-total isolation on my remediated property for over 5.25 years, providing myself with the best opportunity possible to allow my physiological systems to stabilize so I can continue to recover (beginning July 16, 2021)
- Opted out of utility smart meters: I formally requested that the local utility company deactivate the radio-transmitting components inside both my electrical and gas meters (work was completed September 2023)

Note: I had previously covered my smart electric meter with specialized shielding mesh designed for this purpose in April 2021, but I decided complete removal of RF components would be prudent despite the service call fee and recurring monthly cost to opt out.

Damage to RF Shielding Resulted in Unique Testing Opportunity

Two distinct, meteorological events provided unplanned, but scientifically significant opportunities to evaluate the effectiveness of my specialized aluminum RF-shielding mesh. This shielding, which covers western and southern portions of my backyard, suffered serious damage on two separate occasions of windstorms: December 11, 2021, and March 13, 2026. On both occasions, approximately four-fifths (80%) of the physical shielding infrastructure was destroyed.

Within mere hours of the shielding's destruction, my physiological symptoms began returning. Re-engineering and rebuilding the RF shielding panels required multiple days of intense labor by myself and two workers on each occasion. Work was sometimes further delayed by weather and impossible working conditions, or the need to order more of the specialized RF mesh, which isn't available in the U.S. I endured acute health effects/symptoms due to forced re-exposure that lingered for several days even *after* the shielding was completely restored.

Most notably, the later event of 2026 included the return of obscure, long-dormant symptoms that I had completely forgotten I ever experienced in the past because they hadn't happened in 3-5 years or more. Because it cannot be argued that these particular forgotten physical symptoms manifested due to my own conscious thought or anticipatory anxiety, their recurrence entirely eliminates psychosomatic suggestion or "worry" as a causal variable, proving a direct relationship between the symptoms and re-exposure to known RF/EMF sources.

The subsequent return of numerous physiological health effects/symptoms serves as conclusive confirmation of the shielding's protective necessity in preventing symptom recurrence, but even more importantly, causality was proven through remediation three separate times: Multiple documented health effects/symptoms observed to have been

correlated with exposure to RF/EMF from specific sources in my environment, were diminished or eliminated upon the first installation of RF-shielding mesh. The same documented health effects/symptoms returned when the shielding was destroyed in December 2021, then resolved once again after the RF-shielding mesh was re-installed. This sequence of events occurred again in March 2026.

g. Any supporting documentation, including scientific reports, exposure measurements, or other relevant information.

To substantiate the *non-thermal* health symptoms/effects discussed in question 3d, I have conducted extensive environmental monitoring using calibrated electromagnetic field (EMF) meters that cover a wide range of frequencies.

Below are just a few of the recorded measurements I have obtained with RF meters, as well as some general observations:

1. Advanced Metering Infrastructure (AMI) and Efficacy of RF-Shielding Mesh

Unshielded Ambient Exposure: Using a Gigahertz Solutions HF-38B RF meter to take measurements, the regional cellular collector/router mesh network smart meter on my neighbor's property consistently radiated at over 199.9 microwatts per square meter ($\mu\text{W}/\text{m}^2$) at the edge of my property in the backyard. My own smart meter emitted bursts of RF every 2 – 10 seconds, with each burst registering over 199.9 ($\mu\text{W}/\text{m}^2$).²²

Shielded Attenuation: The structural installation of specialized high-attenuation RF aluminum shielding mesh successfully mitigated this RF source, dropping the incoming radiation signature from over 199.9 $\mu\text{W}/\text{m}^2$ down to 5 $\mu\text{W}/\text{m}^2$ measured while standing behind the shielding.

2. Millimeter-Wave (mmWave) Transmissions

Oncoming vehicle intensities: Safe Living Technologies released the Safe and Sound Pro mmWave millimeter wave RF meter in the summer of 2024, and I use it to test for mmWaves in my community. There is currently no fixed 5G small cell infrastructure that registers on my meter while standing on my property.

Testing for mmWaves emitted by modern vehicles has been conducted seven times in the 24 GHz to 40 GHz millimeter-wave frequency range while traveling along a nearby 2-lane road. Substantial spikes in mmWave radiation are directly connected to passing automotive traffic on the adjacent two-lane road. Active vehicular transceivers register bursts generally in the range of 50-500 $\mu\text{W}/\text{m}^2$,

²² It is critical to note that due to the pulsed nature of this specific waveform, the immediate numerical readouts displayed on the RF broadband meter underrepresent the true biological exposure risk. Because broadband power-density meters typically rely on time-averaged or root-mean-square (RMS) sampling, they fail to consistently capture the transient peak power levels occurring at the absolute crest of the wave. Consequently, while the meter displays most pulses from the smart electric meter to measure around 150 +/- 15 $\mu\text{W}/\text{m}^2$, the actual crest values, representing the maximum instantaneous field intensity, are higher.

with the highest acute peak level I've ever measured to date registering 3000 $\mu\text{W}/\text{m}^2$ on September 6, 2026.

3. Comparison of different elevation levels of my home

Second Floor: Ambient radiation levels across all testable frequency spectrums are consistently 2 to 4 times higher on the second floor of my home compared to the ground floor, due to elevated sightlines to towers and antennas, and reduced terrain shielding. The audio feature on my RF meters allows me to monitor changes in the surrounding environment by ear. As I move up the stairs, there is a distinct and dramatic increase in the volume of the signals heard, as more signals mix into the cacophony. This real-time audio tracking has repeatedly indicated that the wireless radiation levels are significantly higher in upstairs rooms.

Basement: The finished basement with poured concrete walls provides the greatest barrier to ambient electromagnetic radiation, consistently maintaining baseline levels that are at least one-half of the intensity found on the main floor.

4. Chronological Diurnal Fluctuations

Peak Societal Demand: I have consistently determined that ambient environmental RF/EMF levels track directly with human behavioral cycles. Due to widespread public device usage and activity during traditional 9-to-5 work hours, RF radiation levels measured during this time are consistently 2 to 3 times higher than levels recorded during the evening and very early morning.

4. We invite healthcare professionals, researchers, and public health practitioners to describe observations from clinical practice, occupational settings, or research that may help identify patterns, if any, of reported potential adverse health effects associated with RF/EMF radiation and exposure.

Not Applicable. I am not a healthcare professional, public health practitioner, or formal academic researcher.

Exposure Standards and Risk Assessment

In the responses that follow for Question 5, my recommendations for systemic regulatory change may initially appear drastic. However, when viewed through the dual lenses of an independent biological researcher and an individual living with a sensitivity to wireless electromagnetic radiation, these updates are logical and necessary to protect human physiology, broader ecosystems, and environmental health.

My technical suggestions directly align with both the consensus of independent global scientists as well as the lived realities of electrosensitive persons. While some of the proactive protective measures highlighted in this document have been successfully implemented by international bodies that already enforce *non-thermal* safety thresholds in regard to RF/EMF exposure, other measures represent original solutions derived

directly from the profound functional barriers I have faced while navigating a default-wireless society.

I submit these observations and suggestions with the profound hope that they will be of practical use to federal health agencies and will be given the strongest possible consideration. Implementing these reforms would not only align United States policy with advanced global precedents, but would also provide an essential pathway for RF-hypersensitive individuals like myself to re-enter public life without suffering health effects/symptoms, and be able to fully participate in society once again.

5. What existing national and international exposure standards, guidelines, or regulatory frameworks should federal health agencies consider when evaluating the potential adverse health effects of human exposure to RF/EMF?

Federal health agencies need to look beyond legacy, industry-dominated thermal standards, and instead evaluate regulatory frameworks anchored in *non-thermal*, biological guidelines. Current domestic standards enforced by the Federal Communications Commission (FCC) and the international guidelines set by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) are fundamentally inadequate because they only protect against *thermal* affects (i.e. acute tissue heating).

I am in full agreement with the authors of a 2022 paper published in *Environmental Health*, that challenge the FCC and ICNIRP's 1996 safety standards for radiofrequency radiation (RFR), demonstrating that the assumptions underlying the set exposure limits are invalid and continue to threaten public health²³. Adverse *non-thermal* effects observed at exposures below the levels assumed to be "safe" include induction of reactive oxygen species, DNA damage, cardiomyopathy, carcinogenicity, sperm damage, and neurological effects. The authors conclude that the current exposure limits do not adequately protect workers, children, hypersensitive individuals, and the general population from short- or long-term RF exposures; and revised limits, based on scientific evidence, are urgently needed.

A 2024 article published in *Reviews on Environmental Health* details how different countries handle exposure standards, with a discussion about persons afflicted with EHS, and how they are left unprotected due to a lack of international and national health policies.²⁴

²³ Belyaev, I., Blackman, C., Chamberlin, K., DeSalles, A., Dasdag, S., Fernández, C., Hardell, L., Héroux, P., Kelley, E., Kesari, K., Maisch, D., Mallery-Blythe, E., Melnick, R. L., Miller, A., Moskowitz, J. M., Sun, W., & Yakymenko, I. (2022). Scientific evidence invalidates health assumptions underlying the FCC and ICNIRP exposure limit determinations for radiofrequency radiation: implications for 5G. *Environmental Health*, 21(1). <https://doi.org/10.1186/s12940-022-00900-9>

²⁴ Leszczynski, D. (2024). The lack of international and national health policies to protect persons with self-declared electromagnetic hypersensitivity. *Reviews on Environmental Health*, 39(2), 163–189. <https://www.degruyterbrill.com/document/doi/10.1515/reveh-2022-0108/html>

While it would represent a significant shift from our current regulatory standards, I strongly advocate for adopting the exposure limits established in Salzburg, Austria. The Salzburg Public Health Department has long been a pioneer in proactive health guidelines, setting a precautionary outdoor limit of 10 $\mu\text{W}/\text{m}^2$ and a strict indoor sleeping limit of 1 $\mu\text{W}/\text{m}^2$ for ambient cell tower radiation.

If public spaces across the United States were held to Salzburg's standards, it would completely transform my life and the lives of all persons with EHS: Because I have already experienced a drastic health effect/symptom reduction due to the modifications I've already made, subsisting in levels that are actually slightly *above* Salzburg's standards within my own partially-shielded home; for our country to adopt Salzburg's limits would mean I could finally return to public life, travel freely, and fully re-enter society after years of forced isolation!

To accurately assess adverse health effects and protect vulnerable populations, federal agencies must prioritize and adopt conservative, biologically-based RF/EMF exposure standards. If Salzburg's standards represent too drastic of a change, I will also present three alternative trusted sources whose recommended exposure limits, grounded in a strong biological basis, which would also serve the people and other biological organisms living in the United States' well.

Some of the standards presented below appear to explicitly discuss levels set for "sleeping" areas. At first, it may seem like outdoor exposure levels could therefore be set higher than the appropriate, biologically-based exposure guidelines for sleeping areas, but that would be a huge mistake.

Outdoor exposure limits would necessarily need to match exposure levels set for *sleeping areas* for the following reasons:

1. Standard window glass offers minimal, if any RF attenuation:

While many buildings and homes may now have modern, Low-Emissivity (Low-E) glass installed, which has a metallic coating that attenuates RF/EMF; exposure limits must be based on a home with *standard* glass, which is most commonly installed in most homes, especially if they are older, non-luxury homes.²⁵

Standard, clear window glass is essentially transparent to RF radiation, offering minimal, if any RF attenuation. Because glass is an electrical insulator, it behaves as a dielectric material. When alternating radio waves (which are high-

²⁵ Modern residential and commercial windows are treated with Low-Emissivity (Low-E) coatings to reflect heat and improve energy efficiency. These coatings consist of microscopically thin, transparent layers of conductive metals (usually silver). Because metal reflects and absorbs radio waves, Low-E glass acts like a Faraday cage. It heavily blocks incoming cell phone signals (4G/5G) and outdoor RF radiation, reducing the signal strength by a factor of 10 to over 10,000 inside the building.

frequency electromagnetic fields) hit standard window glass, the glass does not have the free electrons required to conduct or reflect that energy. Instead, the electromagnetic waves pass straight through it as if it were nearly transparent.

Many bedrooms have a large window in front of which people often place their bed. The person can therefore be considered to be receiving the same RF/EMF exposure as if they were outside on a deck in front of that window if it's made of *standard* glass.

Incentivizing the installation of Low-E glass for windows in new buildings or to update existing buildings would help make all public and private places safer.

2. The higher the elevation, the greater the intensity of RF/EMFs.

It needs to be assumed that many bedrooms are on second floors of homes, or even higher in the case of apartment buildings. The higher one ascends within a building, the intensities of RF/EMF increase as one approaches more direct antenna sight lines and reduced terrain shielding. On pg. 36, I explained my personal observations of this effect using RF meters in my own home, in which I regularly measure RF/EMF intensities amounting to 2-4 times higher in my second floor rooms than on the ground floor.

When determining power levels of antennas, exposure standards must take into account the height of buildings containing sleeping areas, especially if they have windows made of *standard* glass, since there is such a drastic discrepancy in RF/EMF exposure even just between a ground level and a second level in a home.

Below are three possible biologically-based frameworks that account for *non-thermal* health effects of exposure to RF/EMF, already prepared and ready for adoption by the U.S.:²⁶

1) **The BioInitiative Report Guidelines (Scientific Consensus)²⁷**

- Overview: Developed by an international team of renowned scientists, researchers, and public health policy professionals, the BioInitiative Report provides a comprehensive review of thousands of peer-reviewed studies

²⁶ Note that all three frameworks use $\mu\text{W}/\text{m}^2$ for the units used to measure RF/EMF intensities, which are the same units I suggested all further scientific studies need to adopt, as explained on pg. 76; and that I suggested should be used on consumer labeling, as described on pg. 50.

²⁷ BioInitiative Working Group, Sage, C., & Carpenter, D. O. (Eds.). (2012). *BioInitiative Report: A Rationale for Biologically-based Public Exposure Standards for Electromagnetic Radiation*. BioInitiative Working Group. Available at The BioInitiative Report Official Portal, <https://bioinitiative.org/>

documenting *non-thermal* biological effects of RF/EMF exposure *far below* what the current standards in the U.S. allow.

- **Exposure Benchmarks:** The BioInitiative Report recommends a precautionary outdoor chronic exposure limit of 3 to 6 $\mu\text{W}/\text{m}^2$ for pulsed radiofrequency radiation.

For highly sensitive individuals and children, it suggests an even lower indoor threshold of 0.3 to 0.6 $\mu\text{W}/\text{m}^2$.

2) BUILDING BIOLOGY EVALUATION GUIDELINES²⁸

- **Overview:** Originally developed in 2015 in Germany by the Institute of Building Biology + Sustainability (IBN) and the SBM Standard Committee, this framework is a highly precise environmental testing protocol designed to minimize ecological, chemical, and electromagnetic stressors inside residential sleeping areas.

Updated in August 2024 to reflect most recent scientific research, their official Guiding Principle is "*Any risk reduction is worth aiming at. Guideline values are meant as a guide. Nature is the ultimate standard.*"

- **RF Exposure Benchmarks:** The SBM-2015 categorized radiofrequency radiation into strict risk bands. No changes were made to RF radiation standards in the SBM-2024 version. Below are the current guidelines:

RADIO FREQUENCY RADIATION (High Frequency, Electromagnetic Waves) Power density in microwatts per square meter $\mu\text{W}/\text{m}^2$:

< 0.1	no anomaly
0.1- 10	slight anomaly
10 - 1000	severe anomaly
> 1000	extreme anomaly

3) EUROPAEM EMF Guidelines (European Academy for Environmental Medicine)²⁹

- **Overview:** The European Academy for Environmental Medicine (EUROPAEM) developed clinical guidelines specifically designed to help medical professionals

²⁸ https://buildingbiology.com/site/downloads/SBM-2024_EVALUATION_GUIDELINES_EN.pdf

²⁹ Belyaev, I., Dean, A., Eger, H., Hubmann, G., Jandrisovits, R., Kern, M., Kundi, M., Lercher, P., Mosgöller, W., Moshhammer, H., Oberfeld, G., Müller, P., Schätz, H., & Thill, P. (2016). EUROPAEM EMF Guideline 2016 for the prevention, diagnosis and treatment of EMF-related health problems and illnesses. *Environmental Health*, 15(1), 363-385. <https://www.degruyterbrill.com/document/doi/10.1515/reveh-2016-0011/html>

treat and prevent EMF-related illnesses, including Electromagnetic Hypersensitivity (EHS).

- **RF Exposure Benchmarks:** EUROPAEM sets exposure limits based on the type of signal modulation and duration. It recommends keeping daytime ambient exposures below 10 to 100 $\mu\text{W}/\text{m}^2$, and reducing nighttime sleep environments to below 1 to 10 $\mu\text{W}/\text{m}^2$, with a strict cap of 0.1 $\mu\text{W}/\text{m}^2$ for highly sensitive populations or complex, pulsed signals like 4G and 5G.

n. What scientific, technical, or regulatory changes by federal health agencies, if any, would improve the assessment, disclosure, and regulation of wireless radiation exposure?

To safeguard public health and restore regulatory integrity, federal health agencies need to implement sweeping scientific, technical, and regulatory changes that replace legacy thermally-based standards with biologically-based non-thermal RF/EMF exposure standards.

I am not certain to what extent the Department can develop and enforce the suggestions presented in my comment, but it is my hope the Department will forward them to the appropriate department or agency. To improve the assessment, disclosure, and regulation of modern wireless radiation, federal health agencies should consider executing the following programmatic changes:

1) Scientific Reforms:

A) Establish a National EHS Diagnostic and Screening Protocol

In light of the abundance of scientific research into EHS, particularly Dr. Dominique Belpomme's extensive exploration, federal health agencies must formally recognize Electromagnetic Hypersensitivity (EHS) as a new pathology/disease, as explained in response to question 17 on pg. 101.

The best resource for constructing a viable framework of useful biomarkers to make an objective diagnosis is written by Dr. Belpomme and his research partner, Dr. Philippe Irigaray, and can be found on pgs. 313-322 of Chapter 8: "Electro-hypersensitivity as a Worldwide, Man-made Electromagnetic Pathology: A Review of the Medical Evidence" contained within Dr. Panagopoulos's 2023 authoritative textbook, *Electromagnetic Fields of Wireless Communications: Biological and Health Effects*.³⁰

³⁰ Panagopoulos, D. J. (2023). *Electromagnetic Fields of Wireless Communications: Biological and Health Effects*. CRC Press. <https://www.routledge.com/Electromagnetic-Fields-of-Wireless-Communications-Biological-and-Health-Effects/Panagopoulos/p/book/9781032061764>

B) Mandate Provider Education Regarding the Biological and Health Effects from Exposure to RF/EMF

Regulatory bodies must implement mandatory continuing medical education (CME) regarding the biological and health effects from exposure to RF/EMF. It has conclusively been determined by countless published peer-reviewed scientific literature that RF/EMF exposure has been correlated with serious health effects involving every single biological system in our bodies. All practitioners, no matter what their specialty, must be aware of this fact.

Next, practitioners must go beyond awareness and implement the new knowledge within their practice, addressing patients' environmental conditions in cases in which it appears that RF/EMF exposure could be correlated with the development or exacerbation of a diagnosed health effect/condition.

A Note About Health Effect/Symptom 3

To prevent diagnostic errors, a comprehensive understanding of how radiofrequency and electromagnetic field (RF/EMF) exposure can manifest as a musculoskeletal dysfunction needs to become standard training for orthopedic surgeons, physiatrists, chiropractors and physical medicine specialists. My experience with health Effect/Symptom 3's clinical symptoms, discussed on pg. 19, gave the appearance on the surface that I had a permanent structural issue eliciting the effect/symptom I was experiencing, but it ultimately turned out to be a completely reversible condition experienced as a physiological reaction to specific waveforms of RF/EMFs. Without an understanding that a symptom like this is even possible, practitioners risk subjecting patients to invasive or pharmacologic interventions that merely mask the pathology or exacerbate the underlying condition.

2) Technical Reforms:

A) Abolish Artificial Time-Averaging Testing Protocols, and Regulate Peak Power Density During Active Transmit Cycles

Technical testing standards must stop smoothing out (flattening, averaging) exposure data over arbitrary 6-minute or 30-minute windows. This compliance masking hides the highly bioactive, sharp peak intensity microbursts characteristic of modern signal architectures like 5G beamforming and OFDM. Assessment methodologies must log and regulate peak power density during active transmit cycles rather than calculating artificial averages. A good example of how smoothing can mask true exposure levels is on pg. 49, demonstrated with smart electric meter RF emissions.

B) Adopt Synergistic, Multi-Frequency Hazard Modeling

Citizens are no longer exposed to single, isolated devices in a laboratory environment; they are immersed in a dense, cumulative mixture of electromagnetic radiation, combining smart utility infrastructure, transient vehicular transceivers, IoT devices, Wi-Fi, commercial macro towers, cell phones and more. Federal testing metrics must evolve to assess the cumulative, synergistic bio-resonance risks of simultaneous multi-frequency exposure.

3) Regulatory Reforms:

A) Update Regulatory Frameworks for Wireless Infrastructure Placement, Develop Regulatory Cap on Ambient Electromagnetic Radiation

Regulatory frameworks must shift away from distance-only exclusion zones. Current legal standards rely almost entirely on arbitrary physical setbacks from property lines, which completely fail to account for variations in power output, spatial layout, and structural physics, and most importantly, how many other RF transmitters are already in the immediate area.

Instead, infrastructure placement must be strictly determined by predictive power-density modeling, real-world spatial calculations, and RF testing of the surrounding area in which the new antenna is to be installed. Such testing requires on-site, empirical measurements using a spectrum analyzer to capture real-world environmental variables that software simulations may miss.³¹

Furthermore, regulators need to establish a mandatory cap on cumulative ambient RF electromagnetic radiation, using new, biologically-based exposure standards as a guide (i.e. the BioInitiative, Building Biology (SBM) or EUROPAEM frameworks, discussed on pg. 39). If an area is already heavily polluted by existing anthropogenic (human-produced) wireless signals, new infrastructure applications must be automatically denied until existing regional transmitters are either decommissioned or their intensities reduced.

Before any new transmitter installation is approved, a formal evaluation must calculate the maximum cumulative power levels and resulting signal intensity at surrounding habitations to mathematically model that its addition will not increase ambient levels of RF/EMF to unlawful limits under the guidelines to be developed.

³¹ A spectrum analyzer is a piece of professional equipment used to measure and display RF signals across a broad range of frequencies all at once. Instead of just giving a single total exposure number within a narrow range of frequencies, it visualizes the individual "peaks" and "valleys" of the electrical waves on a screen, showing exactly which frequencies are active.

B) Mandate Post-Installation Field Verification and Advanced Spatial Modeling

To ensure regulatory compliance and safeguard public health, federal frameworks must mandate that once a new wireless transmitter is deployed, rigorous on-site field testing be performed on at least two separate occasions during documented peak data-traffic windows. This empirical validation is legally and technically necessary to verify the accuracy of pre-installation mathematical predictive models, and to conclusively ensure that local physical terrain variables have not induced constructive wave interference, creating high-intensity electromagnetic 'hot spots' in the surrounding human habitat.

While manual computational modeling across thousands of rapidly multiplying antennas was historically a logistical and administrative impossibility, modern advanced computing has entirely removed this barrier. Federal health and communications agencies must leverage cutting-edge Electromagnetic Digital Twin (EDT) technology paired with GPU-accelerated Differentiable RF Ray Tracing. By building a dynamic, real-time virtual replica of the built environment, an automated EDT system can ingest specific transmitter variables—including omnidirectional or directional configurations, exact physical height, operational frequency bands, and real-time power densities—and map the resulting cumulative field distributions across a three-dimensional urban landscape.

Emerging 6G infrastructure actively integrates Reconfigurable Intelligent Surfaces (RIS) to purposefully reprogram how waves interact with household surfaces (such as walls, mirrors, and windows). Modern neural network models possess the immediate capability to simulate how non-ionizing radiation reflects, diffuses, and penetrates physical geometry, including complex architectural structures and local biological matrices like tree canopies.

The Department of Health and Human Services needs to mandate the deployment of these predictive surrogate network models to calculate the exact maximum ambient electromagnetic exposure at any given coordinate in space. New infrastructure permits will automatically be denied if the total simulated ambient electromagnetic radiation baseline is projected to exceed biologically safe, *non-thermal* thresholds at any areas within the environment projected to be reached by that particular transmitter's RF/EMR transmissions.

C) Create Mandates for High-Vulnerability Public Environments and Emergency Transportation:

To protect the developing neurology of children, the compromised biology of convalescing patients, and persons with EHS, federal health agencies need to enact strict prohibitions against ambient electromagnetic radiation within our nation's educational and healthcare facilities. These environments house populations with significantly degraded or unformed physiological defense thresholds, and RF/EMF must be minimized, as explained in items 1 and 2.

Two serious issues prevent individuals with EHS from being able to seek help during a life-threatening emergency without the possibility of suffering a compounding life-threatening emergency from the health effects/symptoms elicited by RF/EMF exposure within the healthcare facility and/or in the ambulance transporting them, as explained in items 3 and 4.

1. Mandatory Transition to Hardwired Local Area Networks (LAN) in Educational and Healthcare Institutions

All public and private schools (K-12), childcare facilities, and hospital infrastructure should be prohibited from deploying ambient Wi-Fi networks. To accommodate the fundamental physiological needs of children and patients, including those suffering from Electromagnetic Hypersensitivity (EHS), these facilities must satisfy all data transmission requirements exclusively through hardwired Ethernet cabling. This structural shift eliminates the continuous, low-intensity radiation baseline that currently saturates classrooms and clinical recovery wards.

2. Enforcement of Wireless-Free Educational Sanctuaries

Federal guidance should mandate that all public school grounds maintain a strict "Zero-Wireless-Device" policy during operational hours. All personal cellular devices brought onto school property by students or staff should be completely powered down or placed into a verified, RF-shielded container. This regulation ensures that school boundaries act as an absolute environmental control zone, shielding developing nervous systems from localized, device-specific microbursts and eliminating peer-to-peer cross-exposure in the classroom.

3. Mandate that Hospitals and Large Health Care Facilities Maintain Biologically-Based RF/EMF Exposure Levels Designated For Sensitive Individuals; and That They Provide Basic Accommodations for Patients With EHS

Healthcare environments—including, but not limited to, hospitals, dental clinics, eye offices, and chiropractic practices—are often saturated with high levels of RF/EMF. This exposure stems from wireless medical devices, office hardware like printers and PCs, and patients using mobile devices in waiting areas.

When individuals with Electromagnetic Hypersensitivity (EHS) call to schedule an appointment and inquire about possible accommodations, they may be met with confusion on the other end of the line, which was my limited experience with one health practitioner. In fact, the doctor wanted to personally speak with me before I set up the appointment, because they had never heard of anyone being sensitive to wireless radiation from cell phones and Wi-Fi. I wished I could have offered a crash course, but this topic is far too complex for casual conversation.

While their personal cell phone was left out of the room for my visit, the doctor was unable to turn off the wireless on the PC because it was used to communicate with a wireless diagnostic device necessary for the appointment. They offered me an appointment during a low-traffic time, which was much appreciated.

This experience highlights a critical gap in healthcare education. I believe regulatory bodies must implement mandatory continuing medical education (CME) regarding the biological and health effects from exposure to RF/EMF (see pg. 42). If all health care providers across all fields understood that ambient levels of continuous RF/EMF exposure pose health risks to *everyone* in the building—not just electrosensitive patients—health facilities might proactively transition to low-RF/EMF environments since it would be the healthy thing to do, making healthcare more accessible for those with EHS, and safer for everyone else.

While transitioning every healthcare facility into a low-RF/EMF environment will take time, my experience highlights the urgent need for immediate action, starting with mandatory hardwired Local Area Networks (LAN) in major hospitals (see pg. 45), and next, to start verifying with EMR Specialists, that large healthcare facilities are maintaining RF/EMF levels designated for sensitive individuals, such as the BioInitiative guidelines for highly sensitive individuals of 0.3 to 0.6 $\mu\text{W}/\text{m}^2$ (see pg. 39).

Basic accommodations must be available to patients with EHS:

- No wireless devices of any kind will be in the examination room (including laptops, phones or tablets that a doctor might normally bring)
- The patient will be escorted immediately to the exam room to wait for their appointment there, preventing exposures to cell phone radiation from other patients in the standard waiting room.

The gravity of this situation cannot be overstated: when individuals with EHS are barred from entering a *hospital* due to a total lack of accommodations, they are forced to risk life-threatening complications just to receive basic care. Proactively reducing and eliminating wireless infrastructure in these critical spaces is a vital step toward ensuring equitable healthcare access.

4. Mandate Kill Switches For RF Transponders on Emergency Medical Services (EMS) vehicles

Emergency Medical Services (EMS) vehicles must be equipped with a simple kill switch for the RF transponders in the case of having to transport a patient known to be sensitive to RF/EMF to the hospital. Particularly in the case of someone who suffers heart or breathing effects/symptoms in response to exposure to

RF/EMF, this is absolutely imperative, or they could die in the ambulance from an entirely preventable cause!

As I explained on pg. 21, a *single* EMS vehicle parked in front of my home elicited health effects/symptoms (including Effect/Symptom 3), while I was standing outdoors *behind* my house, a point measured on Google Earth to be 85 feet from the vehicle parked in the street out front.

Given that experience, I am certain there is no way I could ever be transported to a hospital in an emergency vehicle with such powerful RF/EMF emissions without suffering serious, life-threatening health effects/symptoms.

D) Regulation of Automated Metering Infrastructure (Smart Utility Meters)

Instead of allowing mesh network smart utility meters to continue to roll out in even more communities, they need to be reeled in immediately.

1. Viable Hardwired Technological Alternatives Should Be Incentivized and Implemented:

Utilities can achieve secure, remote, and instantaneous monitoring without emitting a single pulse of RF radiation or generating structural dirty electricity by utilizing established, hardwired alternatives:

- a. Wired Ethernet (LAN / RJ45 Cables): Advanced commercial and residential smart meters are manufactured with native RJ45 Ethernet ports on their internal circuit boards. This allows consumption data to travel securely over physical Category 6 (Cat 6) cables using standard internet protocols. This is already a standard practice in industrial facilities and multi-dwelling commercial complexes where concrete structures block wireless signals.
- b. Fiber Optic Networks: This represents the absolute gold standard for data security and environmental safety. Global utility manufacturers produce smart meters with firmware capable of connecting directly to fiber-optic networks. Data is transmitted entirely via pulses of light inside a glass tube, generating zero RF radiation and zero electromagnetic transients along the line.

As current smart meter infrastructure ages out within a community (my understanding is that the meters only last about 15 years), it must be mandated that all further smart meter installations are hardwired only, using one of the two methods above (or any other methods I am not aware of that do not involve emitting RF). These regulations need to apply to all standard utilities a homeowner may have: electric, gas, and water.

2. Residents must have the unconditional, nationwide right to opt out of smart meter installations on one's property.

While wireless smart meters are being slowly replaced with wired alternatives, as suggested above, there must be an immediate, nationwide law granting citizens an unconditional right to opt out of smart electric and gas utility meters *without* requiring a physician's note.

This right also needs to be extended to municipal smart *water* meters. Municipalities and consumer water providers must be held to the same standards and regulations as electric and gas companies, many of which *do* offer opt-out programs.³²

3. Monthly smart meter opt-out fees must be capped.

While wireless smart meters are being slowly replaced with wired alternatives, as suggested above, monthly opt-out fees should be strictly capped at no more than \$10/month per utility provider. I have observed current utility providers' fees in Michigan to range from \$9.99 to \$50.00 a month (\$600 annually), depending on the provider.

This is an unconscionable financial barrier for disabled, unemployed or low-income individuals, many of whom are in this very situation due to their sensitivity to RF/EMF.

It shouldn't cost ½ a month's rent or more per year just to maintain a safe, non-toxic home environment in order to avoid suffering acute and chronic health symptoms, effects and conditions from having a mesh network smart utility meter emitting RF/EMF "network chatter" pulses 24/7.

4. Customers must be able to deny to smart meter router installations on their property.

Smart utility meters represent a catastrophic regulatory failure regarding ambient public exposure in residential zones. Currently, utility providers are permitted to install high-powered mesh network routers *directly onto personal residences* without informed consent or neighborhood notification.

I discovered this firsthand, as I located a router inside the smart electric meter on my neighbor's home using an RF meter (refer to pgs. 21 and 27, in which I explain how that router's RF emissions are correlated with Effects/Symptoms

³² Having a *monthly* visit from utility workers could potentially be eliminated. Customers should be able to upload photos of their water, gas or electric meters, or even better, enter usage data online so that the system could be automated and wouldn't require an additional expenditure by the utility. Periodically, a person from the utility company could be sent out to verify the accuracy if necessary (i.e. for tax purposes, or if usage reported is suspected to be inaccurate).

3 and 5; and pg. 35 where I explain some of the router's intensity measurements obtained with my RF meter).

This must be changed---not only must utility customers be *informed* if their provider wants to install a router on their home, they must have the *right to deny its installation*, forcing the utility company to install the router separately on the property it owns (i.e. the "utility easement"). No high-powered router should ever be hidden inside someone's smart utility meter, unbeknownst to the homeowner, which is the current practice.

According to smartmetereducationnetwork.com, approximately one in 17 homes has the router inside their smart meter. This router operates as the collection point for all the other homes' smart meter transmissions in an area, and transmits all the surrounding meters' data to the utility company. As one utility worker is quoted to have said, "*We know the person who has a collecting meter on their home is going to have a funeral coming up soon.*"³³

Utility companies must be mandated to disclose router installations to the homeowners of all residential properties affected, so that the homeowner can grant or deny consent to continue the router's operation on their property.

5. Actual RF Emissions from Smart Utility Meters Must Be Reported Without Smoothing/Flattening/Averaging the Data:

Utility compliance documentation and the Manufacturer's White Papers frequently state that these types of meters transmit for only a short total duration per day---typically *averaging* between 83 and 118 seconds of *cumulative* transmission time, which doesn't sound like much.

This illustrates the harm of smoothing/flattening/averaging the data---it masks what independent RF testing assessments of smart utility meters have repeatedly shown---this seemingly small reported cumulative time is broken into *thousands* of exceptionally sharp, microscopic *millisecond* pulses scattered across a 24-hour cycle to sync the network, maintain time, and route traffic (referred to as "network chatter"). If the pulses only transmit for a millisecond, that means 1000 pulses could take place in a single second's time. If the meter transmits for 83 seconds, that's 83,000 pulses being emitted from the meter in one day!

My personal RF testing data of multiple mesh network smart electric meters in my community determined that they are broadcasting intense, short bursts of radiation every 2 to 10 seconds, all day long (see pg. 35 for details).

³³ <https://www.smartmetereducationnetwork.com/smart-meters-what-they-are-and-what-they-do.php>

6. Physiological and Spatial Harm From Thoughtless Placement of Smart Meters Must Be Corrected:

The placement of these mesh network smart meters is entirely unplanned, partially because they are being installed on older homes, back when utility drops were established without knowing that RF radiation would eventually be emitting from the meter location from microwave-emitting utility meters.

At my home, the unplanned and unfortunate placement resulted in a neighbor's "collector" meter containing the router, as well as a different neighbor's regular smart electric meter, each aligned to point into my corner kitchen windows by my sink (one meter points at each window). This constant RF exposure was demonstrated to be a direct trigger of both Effects/Symptoms 3 and 5 (refer to pgs. 21 and 27, respectively).

E) Mandate Consumer-facing Labels Indicating RF Peak Power In $\mu\text{W}/\text{m}^2$

Federal regulators should mandate transparent, consumer-facing labels on all wireless hardware and connected infrastructure. Similar to food nutrition facts, this disclosure should feature a standardized "radiation profile" label printed directly on the product packaging, clearly detailing the device's operating frequency bands and its maximum peak power density measured in microwatts per square meter $\mu\text{W}/\text{m}^2$.

Utilizing microwatts per square meter ($\mu\text{W}/\text{m}^2$) as the universal unit of measurement on consumer labeling is imperative. These are the units required for meaningful, granular measurements, already utilized by the currently available biologically-based guidelines—such as the BioInitiative, Building Biology (SBM) or EUROPAEM frameworks, discussed on pg. 39.

Displaying measurements on the proposed consumer labels in the *same* units as the guidelines are utilizing is the only way consumers could immediately evaluate a device's emissions against documented *non-thermal* safety thresholds.

This mandatory labeling would ensure consumers can make informed, data-driven safety decisions before introducing new RF/EMF sources into their homes.

F) Regulations for Devices/Appliances with Offline Functionality

To eliminate involuntary environmental stressors and establish a market that accommodates environmentally sensitive consumers, federal health and communications agencies should implement the following regulations for all consumer devices and appliances possessing *offline* functionality:

1. Shift to an Opt-In "Default-OFF" Manufacturing Baseline

Currently, consumer goods are delivered in a "Default-ON" configuration, resulting in RF/EMF exposure the moment a product is unboxed and plugged in or turned on. Regulatory frameworks must reverse this baseline, mandating that all consumer technologies are shipped with every wireless radio completely *deactivated* by default.

Wireless connectivity must operate strictly as an opt-*in* feature, requiring explicit, conscious user activation during the initial setup sequence. This structural pivot ensures that offline-capable appliances remain non-transmitting unless the consumer affirmatively decides otherwise.

2. Mandatory Physical Disconnect Switches for High-Intensity Devices

For any consumer device, appliance, or vehicle that generates an active localized field strength *exceeding* $10 \mu\text{W}/\text{m}^2$, manufacturers must be legally required to install a dedicated, physical, hardwired ON/OFF *switch*. This mechanism must completely cut electrical power to the wireless transceiver chips independently of the device's core mechanical function. Software-based deactivation is insufficient for high-intensity hardware, as background firmware updates frequently override user preferences and reactivate latent radios without consent.

3. Top-Tier Software Toggles for Low-Intensity Hardware

For smaller, low-power devices emitting peak signals *at or below* the $10 \mu\text{W}/\text{m}^2$ threshold, manufacturers must provide a clear software control toggle. This wireless deactivation menu must be located within the primary, top-tier user interface screen.

G) Create Regulatory Standards for Medical Diagnostic Equipment, Fitness Equipment, and RF-based Automotive Systems

To effectively accommodate the millions of Americans suffering from Electromagnetic Hypersensitivity (EHS), and prevent millions more from acquiring it, federal regulatory agencies must mandate strict hardware and software modifications that return control of RF exposures to the consumer.

Medical Diagnostic Equipment, Fitness Equipment, and RF-based automotive systems are increasingly engineered to broadcast continuous wireless signals even when the device is completely idle or the wireless feature is entirely unnecessary for core operation. Most devices ship to consumers with RF transmissions *enabled* as the default setting, which is unfair to sensitive populations who then have to find

someone to help disable the wireless connection just so they can use the device in standalone mode.

1. Medical Diagnostic Equipment

Specialized health monitors designed for home use that *can* function as stand-alone devices routinely feature active, non-removable wireless transmitters that broadcast continuously and cannot be disabled by any means. My personal experience with an EKG monitor is discussed on pg. 94.

Regulatory frameworks must require medical hardware to include true airplane-mode isolation features to prevent vulnerable patients from facing chronic cardiac and neurological stress from their own diagnostic equipment, and to protect those consumers who do not want, or are sensitive to RF exposure. Medical Devices must be shipped with wireless modules deactivated (default-OFF).

The integration of non-removable Bluetooth transmitters into continuous heart monitors represents a critical design absurdity, forcing patients with underlying cardiovascular vulnerabilities to endure localized radiofrequency radiation exposure, when it is well known that the heart's electrical rhythms have been documented to be affected by exposure to RF/EMF.³⁴

2. Fitness Equipment

Modern exercise machinery (such as consumer treadmills) contains built-in Bluetooth and Wi-Fi transceivers permanently active by default, saturating the user's localized workout environment regardless of whether they have paired a personal device. This is especially dangerous for cardiac patients wishing to improve their health by using such exercise equipment, as explained above, although people with healthy hearts are also known to experience effects from RF/EMF emissions.

Demonstrating the extreme obfuscation of wireless transmitter controls, eliminating the wireless signal on my personal treadmill required communication with several manufacturer support departments, only to finally learn that deactivating the Bluetooth transceiver required inputting a hidden, proprietary sequence of keystrokes on the console to unlock an unlisted administrative menu. Thankfully, someone at the company provided the instructions to me, which worked, as verified with my RF meter. Refer to footnote 15 for more information regarding the Bluetooth emissions on my treadmill.

³⁴ Parizek, D., N Visnovcova, K Hamza Sladicekova, Misek, J., Jakus, J., J Jakusova, Kohan, M., Z Visnovcová, N Ferencova, & I Tonhajzerova. (2023). Electromagnetic fields - do they pose a cardiovascular risk? *Physiological Research*, (Vol 72(2)), 199–208. <https://doi.org/10.33549/physiolres.934938>

3. RF Sources in New Vehicles

- a) Modern automotive cabin environments have become intense RF exposure zones due to integrated infotainment systems that constantly search for wireless devices with which to sync, radiating occupants even when the vehicle is in motion and no mobile devices are connected.
- b) The rapid deployment of Child Presence Detection (CPD) systems utilizing 60 GHz millimeter-wave (mmWave) radar introduces a severe and unprecedented layer of localized electromagnetic radiation directly into the automotive cabin. By operating at such extremely high frequencies, these in-cabin radar arrays subject occupants to continuous, highly polarized, and complex pulsed signals within a confined, metal-enclosed environment that can exacerbate signal reflection.

This creates a permanent, high-intensity exposure zone where passengers, including developing infants and sensitive individuals, cannot escape the field. Consumers shouldn't have to expose their occupants to RF/EMF in order to have a modern vehicle. Regulatory bodies need to recognize the profound biological risks associated with forcing its population to ride inside what is essentially an active radar chamber. Immediate mandates should be established to require automotive manufacturers to provide a clear, accessible hardware disable switch for consumers.

H) Regulate Lower Emissions for Wi-Fi Routers and Incentivize Retrofitting with Cat 6 Cabling

As explained in detail on pg. 88, Wireless Local Area Networks (WLAN), operating under the commercial term Wi-Fi, represent the single largest source of continuous, close-range indoor RF/EMF exposure for the general population. To mitigate the indoor burden of Wi-Fi, federal guidelines should consider incentivizing structural retrofitting using Cat 6 cabling with localized RJ45 Ethernet jacks on every floor of a home. Transitioning society back to hardwired connectivity would eliminate ambient indoor fields while simultaneously generating thousands of infrastructure installation jobs nationwide.

If an installation absolutely must be wireless, Eco-routers are the safest choice. Eco-routers transmit at far lower intensities, and have other beneficial features in regard to wireless safety. One such model has three different levels selectable intensities, with the lowest measuring approximately $280 \mu\text{W}/\text{m}^2$, whereas a traditional router can measure around $31,300 \mu\text{W}/\text{m}^2$. This model also emits fewer pulses per second, and automatically turns off when the Wi-Fi in all connected devices is disabled.

There is no justifiable reason *all* routers couldn't be regulated to *require* this safer design to protect human health.³⁵ All routers should be "eco-routers."

o. Is additional research needed to develop, test, and evaluate the effectiveness of procedures and techniques for minimizing exposure to electronic product radiation? Where are the largest gaps, if any, in knowledge? What research is needed to appropriately evaluate current or future national and international exposure standards, guidelines, or regulatory frameworks.

To bridge critical research and infrastructure gaps, federal health agencies should direct future investigations and resources into the following two domains:

1) Standardization, Oversight, and Independent Certification of Shielding Hardware

A massive public knowledge and regulatory gap exists regarding the efficacy of consumer materials marketed as radiation defenses or RF shields. Because there is no official oversight, the market is saturated with unverified, sham protective items often endorsed by public figures or popular media. When consumers purchase these unbacked products and realize they are physically ineffective, it fundamentally undermines public trust, driving widespread skepticism regarding the very real biological harms of exposure to RF/EMF.

Federal agencies should implement a rigorous, standardized product testing framework:

A) Establish a Centralized Independent Testing Authority

Federal health agencies should consider authorizing an independent safety science body—operating under a strict public health mandate similar to the safety certification framework utilized by Underwriters Laboratories (UL) to issue consumer "UL Certified" safety marks. No shielding or attenuation item should be legally marketed as protective without passing a rigorous, independent laboratory evaluation.

B) Mandate Standardized Product Specification Sheets

Certified mitigation hardware should be legally required to feature a transparent technical specifications sheet. This sheet would display the exact attenuation performance curves across specified frequency spectrums, directly matching the data transparency found in professional hardware, such as specialized RF shielding mesh.

³⁵ How much radiation does the JRS Eco 100 WiFi router emit compared to an ordinary router? EMF measurements and range. (2026). JRS Eco Wireless. <https://www.jrseco.com/faqs/range-and-measured-emfs-versus-transmit-power-setting-for-the-jrs-eco-100-routers/>

C) Implement Quantitative Classification Labels

Approved mitigation devices should carry a *physical* label detailing the product's verified shielding capacity and minimum/maximum frequency thresholds measured in microwatts per square meter ($\mu\text{W}/\text{m}^2$). This ensures that everyday consumers do not require an advanced academic background to verify that a product's protective capabilities are anchored in empirical, reproducible physics rather than deceptive marketing claims.

2) Technical Gaps in Next-Generation Infrastructure and Complex Wave Modulations

Legacy research predominantly evaluates static, continuous, or unmodulated wave baselines, creating a dangerous data vacuum regarding the multi-frequency environments citizens inhabit today.

Federal research grants should be immediately prioritized to evaluate the *non-thermal* biological impacts of three critical technical vectors:

A) Advanced Modulation and Pulse Architecture used in 5G

Immediate investigation is required to analyze how complex artificial modulation protocols, such as the orthogonal frequency-division multiplexing (OFDM) and localized packet bursts utilized in 5G infrastructure, interact with human cell membranes. Ample evidence indicates that heavily modulated and pulsed frequencies are drastically more bioactive than continuous transmissions, yet current safety guidelines completely ignore these signal architecture differences.

B) 5G Transmissions (both mid-band, Millimeter-Wave (mmWave), and near-mmWave)

Comprehensive, long-term biological studies should be executed. Research needs to expand beyond fixed macro towers to evaluate the localized, acute health effects of mobile transient transceivers, such as the high-powered radar and wireless communication modules increasingly integrated into connected consumer vehicles.

Strong evidence exists that my exposure to near-mmWaves (~19 GHz) way back in 2004-2008, appears to have been directly correlated with Effect/Symptom 2, given that I experienced it again during July 2020, outdoors only, away from home, where there may have been mmWaves being transmitted (pg. 15). While true mmWave technology is officially supposed to be within the 24 to 300 GHz spectrum, I believe the near-mmWave wavelengths, like the one I was exposed to, are just as biologically active, and should also be further studied.

I also documented health Effect/Symptoms 5 (pg. 26), when the new 5G midband signals rolled out in July 2020 in my area. These experiences illustrate the extreme

bioactive nature of these newer signals as well since the effect to my health was immediate upon their roll-out.

The official 2021 European Parliament Study regarding the biological and health effects of RF/EMF (summarized briefly and cited on pg. 71) highlights a critical public safety gap regarding next-generation higher frequencies (24 to 100 GHz millimeter waves), finding no adequate biomedical studies on their *non-thermal* health impacts. We are still in need of this research.

C) 6G Terahertz (THz) Transmissions

Federal agencies need to proactively establish a biological safety baseline for emerging 6G networks operating in the sub-terahertz and terahertz bands. Deploying a massive public infrastructure rollout within these ultra-high frequency ranges without pre-market, long-term, *non-thermal* toxicological testing constitutes a severe regulatory hazard. We can't afford to make the same mistake that was made with the unstudied rollout of 5G technology.

p. How, if at all, should a classification system account for exposure-related characteristics, including operating frequency, power density, specific absorption rate (SAR), electric- and magnetic-field strength, modulation and pulse characteristics, duty cycle, beamforming, simultaneous exposure to multiple frequencies, duration of exposure, distance from the source, proximity to the body, and cumulative exposure over time?

A classification system is only effective if it mirrors human biological reality. The federal government must reject industry-standard smoothing/flattening/averaging protocols and instead, build a multidimensional safety matrix that categorizes radiation sources by their peak pulse intensity, structural modulation patterns, and cumulative temporal duration.

An updated federal classification system needs to fundamentally shift away from legacy, time-averaged thermal models and instead account for the real-time, *non-thermal* biological impacts of complex signal architecture.

To accurately protect public health, a modernized classification framework should evaluate the listed exposure characteristics as follows:

1. Modulation and Pulse Characteristics (Highest Priority):

Artificial, heavily modulated, and sharply pulsed signals (such as orthogonal frequency-division multiplexing [OFDM] and beamforming packets used in 5G) are significantly more biologically active than continuous waves.

A classification system must assign a higher hazard multiplier to pulsed/modulated transmissions versus unmodulated signals of the same power density.

2. Duty Cycle and Cumulative Exposure:

Rather than smoothing/flattening/averaging a device's transmission time to make its emissions appear deceptively low, the classification framework must log the peak power density during active transmit microbursts.

Cumulative exposure metrics must track long-term chronic duration, acknowledging that lower-intensity exposure over years can erode physiological defenses.

3. Beamforming and Field Strength:

Advanced multi-antenna systems concentrate high-intensity RF energy into highly focused, localized steerable beams. The classification system must evaluate exposure based on these localized peak spatial bursts rather than calculating broad, omnidirectional spatial averages across an empty room.

4. Simultaneous Multi-Frequency Exposure:

In modern environments, citizens are never exposed to a single isolated frequency; they are immersed in a dense, multi-frequency mixture of electromagnetic radiation. The classification framework must adopt a synergistic hazard model where multi-frequency environments are categorized by cumulative bio-resonance risk rather than treating each device as a standalone emitter.

5. Distance, Proximity to the Body, and SAR:

Specific Absorption Rate (SAR) testing must be overhauled to account for *non-thermal* biological vulnerabilities rather than literal tissue "cooking." For devices operated in close proximity to the body, the classification matrix must enforce strict precautionary distance buffers. Devices worn directly on the skin need to have much stricter standards since there is no exponential drop-off of field strength over distance experienced in that scenario, as in other consumer products.

6. What scientific evidence exists about potential adverse health effects caused by current exposure limits?

Anthropogenic electromagnetic fields (EMFs) actively interface with the delicate, endogenous electrical architecture of living systems by exerting physical forces on polar molecules and charged particles. Because biological organisms are primarily composed of water, mobile electrolytes, and highly conductive aqueous cellular frameworks, external electromagnetic radiation (EMR) manipulates these components relative to the frequency, waveform, and power density of the field.

A stark example of this physical interaction occurs at 2.45 GigaHertz (GHz)—the exact operating frequency utilized by consumer Bluetooth hardware and Wi-Fi routers. Most consumers remain entirely unaware that this frequency baseline is identical to the narrow microwave band engineered into commercial ovens to heat food. Within a microwave oven, these fields force polar water and sugar molecules to structurally realign themselves with a shifting electromagnetic vector 2,450,000,000 (2 billion, 450 million) times per second.

Subjecting human biology to ambient infrastructure that forces such intense molecular vibration disrupts natural intracellular movement, protein folding, and biochemical cascades. Physical disruptions to biological components following exposure to RF/EMF are demonstrated via high-definition molecular modeling in the recorded address titled *Wireless tech forum: Biological mechanisms (Dr. Paul Heroux)*.³⁶ Dr. Heroux details how alternating currents shake and agitate cellular water structures, leading to an immediate down-regulation of ATP production and eventual cell death.

RF/EMF exposure affects all living organisms, down to microscopic prokaryotes, and even individual cellular structures of multicellular organisms like humans. Peer-reviewed microbiological evaluations—such as the study titled *Evaluation of the Effect of Radiofrequency Radiation Emitted From Wi-Fi Router and Mobile Phone Simulator on the Antibacterial Susceptibility of Pathogenic Bacteria Listeria monocytogenes and Escherichia coli*—confirm that *non-thermal* exposures to 2.4 GHz Wi-Fi and mobile phone signals significantly alter bacterial growth rates and accelerate times to reach logarithmic growth phases.³⁷ These controlled exposures induce specialized adaptive phenomena within a narrow irradiation window, driving increased antibiotic resistance in common pathogens like *Escherichia coli* and *Listeria monocytogenes*.

Because anthropogenic RF/EMF functions as a systemic biological agitator rather than a foreign chemical substance, classical toxicology models and predictable linear dose-response curves fail to apply. In conventional pharmacology, reducing the chemical volume mitigates the physiological impact. However, with highly structured, information-carrying wireless signals, reducing the power does not inherently weaken the biological response. Due to the fully polarized and coherent nature of modern telecommunication waves, even an immeasurably weak, low-intensity signal has been demonstrated to deeply interfere with homeostatic cellular functioning.

The Request for Information (RFI) issued by the Department of Health and Human Services (HHS) serves as a commendable and necessary step toward consolidating the extensive, existing body of peer-reviewed data rather than unnecessarily expanding basic research.

³⁶ Patrick Colbeck. (2019, January 7). *Wireless tech forum: Biological mechanisms (Dr. Paul Heroux)* [Video]. YouTube. <https://www.youtube.com/watch?v=nJyQk3Y6NGE>

³⁷ Taheri, M., Mortazavi, S. M. J., Moradi, M., Mansouri, S., Hatam, G. R., & Nouri, F. (2017). *Evaluation of the effect of radiofrequency radiation emitted from Wi-Fi router and mobile phone simulator on the antibacterial susceptibility of pathogenic Bacteria Listeria monocytogenes and Escherichia coli*. Dose-Response, 15(1), 155932581668852. <https://doi.org/10.1177/1559325816688527>

Due to strict time constraints, I was not able to include my entire multi-year collection of literature within this comment. However, I have carefully compiled a diverse cross-section of foundational studies. These selected articles explicitly span multiple physiological disciplines to demonstrate the undeniable, *non-thermal* biological hazards of exposure to RF/EMF to numerous bodily systems at currently permissible exposure levels.

Historical Precedent of Federal Knowledge: The NMRI Glaser Bibliography

The historical record conclusively demonstrates that federal health and military agencies have been fully aware of the profound, *non-thermal* biological impacts of radiofrequency radiation since at least the early 1970s. A cornerstone of this foundational evidence is the landmark bibliography compiled by Dr. Zorach "Zory" R. Glaser³⁸, a pioneering scientist and Commissioned Officer in the U.S. Navy and Public Health Service. Dr. Glaser's seminal 1976 Naval Medical Research Institute (NMRI) consolidated report cataloged over 3,700 global scientific references detailing the diverse biological phenomena and clinical manifestations attributed to microwave and radiofrequency exposure.³⁹ Crucially, Dr. Glaser meticulously reviewed and translated Eastern European and Soviet literature, which had already extensively documented low-level, *non-thermal* disruptions to the central nervous system, cellular metabolism, and cardiovascular health—vulnerabilities that modern public exposure standards *continue* to ignore.

To preserve this monumental research repository and ensure it remains accessible for contemporary regulatory analysis, Dr. Magda Havas, prominent researcher of the biological and health effects from exposure to electromagnetic radiation, acquired and actively maintains Zory's Historical Archive.⁴⁰ This digital archive consists of 26 curated, open-source volumes accessible under the "Historical References" section of Dr. Havas's platform and cross-listed as "Annotated Papers" on Dr. Glaser's official portal. For each volume, Dr. Havas provides a critical scientific synopsis and commentary before directing users to the primary document scans.

Regulators navigating these archives should note a critical document discrepancy: the widely circulated scanned copy of the expanded 1976 Bibliography is missing a vital summary page that aggregates the specific biological effects discovered up to that point. However, this critical missing data can be retrieved by cross-referencing the original 1971 NMRI edition⁴¹, which contains an unedited "Chapter 1" beginning on

³⁸ <https://zoryglaser.com/>

³⁹ Glaser, Dr. Z. R., Brown, P. F., & Brown, M. S. (1976, September). *Bibliography of Reported Biological Phenomena ("Effects") and Clinical Manifestations Attributed to Microwave and Radio-Frequency Radiation*. <https://mdsafetech.org/wp-content/uploads/2020/09/naval-research-bibliography-zory-glaser-1976-.pdf>

⁴⁰ <https://magdahavas.com/from-zorys-archive/introduction-to-from-zorys-archive/>

page 9 that clearly and explicitly lists the systemic biological and neurological effects verified by the military *over fifty years ago*. I will list the categories of bodily systems determined to have been affected below:

Central Nervous System (CNS): Behavioral changes, fatigue, headache, and autonomic nervous system responses.

Ocular Effects: Development of cataracts and lens opacities.

Metabolic and Biochemical: Alterations in blood chemistry, enzyme activity, and cellular metabolism.

Cardiovascular and Thermal: Thermogenesis (tissue heating), blood pressure changes, and heart rate fluctuations.

Medical Device Interference: Electromagnetic interference with cardiac pacemakers

Academic Contributions of Dr. Dimitris J. Panagopoulos

Dr. Dimitris J. Panagopoulos is a prominent biophysicist whose pioneering research has fundamentally reshaped our understanding of *non-thermal* biological harms of exposure to electromagnetic radiation. His experimental work was among the first to establish a definitive, causal link between man-made wireless communication fields and structural DNA damage and reproductive decline.

The 2015 study, “*Polarization: A key difference between man-made and natural electromagnetic fields, in regard to biological activity*,” demonstrates that man-made electromagnetic fields (EMFs) are highly bioactive compared to natural EMFs because they are *polarized*. When an EMF is “polarized,” it means the electric field component of the wave oscillates in a specific, organized, and predictable direction (such as along a single plane) rather than randomly.

This polarization causes man-made fields to constructively interfere, amplifying their intensities; and forces charged molecules and free ions near cells to oscillate in unison. These anthropogenic synchronized ionic oscillations exert powerful, additive forces on cell membrane sensors, disrupting the cell's electrochemical balance and triggering adverse biological and health effects—even though *natural* EMFs are often stronger and more prolonged.⁴²

⁴¹ <https://zoryglaser.com/wp-content/uploads/2020/05/BIBLIOGRAPHY-OF-REPORTED-BIOLOGICAL-PHENOMENA-EFFECTS-AND-CLINICAL-MANIFESTATIONS-ATTRIBUTED-TO-MICROWAVE-AND-RADIO-FREQUENCY-RADIATION-C.pdf>

⁴² Panagopoulos, D. J., Johansson, O., & Carlo, G. L. (2015). Polarization: A key difference between man-made and natural electromagnetic fields, in regard to biological activity. *Scientific Reports*, 5(1), 1–10. <https://doi.org/10.1038/srep14914>

Dr. Panagopoulos is most renowned for developing the Ion Forced-Oscillation Mechanism, a highly influential biophysical theory that mathematically explains how totally polarized, *coherent* artificial frequencies force irregular oscillations within voltage-gated ion channels, triggering cellular dysfunction and oxidative stress.⁴³

In physics and biophysics, "coherent" means that the electromagnetic waves maintain a fixed, predictable relationship in their phase over time and space. To understand how this relates to cell membranes, it helps to look at the difference between how natural light and man-made wireless signals (both of which are electromagnetic radiation) behave:

The Analogy: A Walking Crowd vs. a Marching Army

- Incoherent (Natural Radiation): Natural radiation from the sun or cosmic background is like a crowded plaza where everyone is walking at their own pace, in different directions, and bouncing around randomly. Because their movements clash and cancel each other out, they cannot easily knock over a heavy obstacle.
- Coherent (Man-Made Radiation): Anthropogenic wireless signals are like a highly trained marching army. Every soldier's foot hits the ground at the exact same microsecond (in phase). Because they are completely synchronized, their combined footsteps generate a powerful, unified, rhythmic vibration.

Why Coherence Matters to the Plasma Membrane:

The *coherence* of wireless signals is precisely what allows them to interact with living cells at low intensities:

- Additive Force: Because the waves are coherent (synchronized), the electric field forces do not cancel each other out. Instead, they add together.
- Forced Oscillation: This unified, rhythmic force acts upon the free ions floating right outside the cell's plasma membrane. The coherent wave forces these ions to oscillate (vibrate) back and forth in perfect harmony with the signal. This coordinated movement exerts a steady, unnatural electrostatic pressure on the cell's delicate, voltage-gated ion channels (VGICs), effectively "jiggling" the cellular gates open or closed. This destroys the VGICs ability to do their job, which is to open and close at very specific times in order to keep certain molecules inside the cell, and certain ones out.

Furthermore, his research has rigorously demonstrated the severe scientific limitations of the industry-standard Specific Absorption Rate (SAR) metric, proving that SAR fails to capture *non-thermal* biological realities and that highly variable, real-life device emissions are exponentially more bio-destructive than steady, simulated laboratory waves.

⁴³ Panagopoulos, D. J., Karabarbounis, A., Yakymenko, I., & Chrousos, G. P. (2021). Human-made electromagnetic fields: Ion forced-oscillation and voltage-gated ion channel dysfunction, oxidative stress and DNA damage (review). *International Journal of Oncology*, 59(5), 92. PubMed Central. <https://doi.org/10.3892/ijo.2021.5272>

This extensive mechanistic and experimental expertise culminates in his authoritative 2023 reference textbook, *Electromagnetic Fields of Wireless Communications: Biological and Health Effects* (CRC Press). See footnote 30 for citation. As the editor and a principal author, Dr. Panagopoulos orchestrates a multidisciplinary compilation of global expert research spanning physics, pathology, epidemiology, and environmental science.

The textbook systematically bridges the gap between empirical observations and molecular explanations, documenting how commercial 2G through 5G telecommunications infrastructure, Wi-Fi, and cordless telephony drive severe pathologies like EHS, cancer, and infertility. Ultimately, this textbook serves as a comprehensive biophysical roadmap designed to guide regulatory agencies away from outdated thermal standards and toward the implementation of strictly biologically-based public exposure limits.

I strongly suggest the Department purchase this book as required reading for anyone that is going to be involved in the project of determining the updated exposure standards. Below is a link where the book can be purchased:

<https://www.routledge.com/Electromagnetic-Fields-of-Wireless-Communications-Biological-and-Health-Effects/Panagopoulos/p/book/9781032061764>

Synthesis of Epidemiological and Mechanistic Evidence Linking RF/EMF to Carcinogenesis

The global body of peer-reviewed scientific literature demonstrates an increasingly robust and cohesive link between anthropogenic radiofrequency (RF) radiation, electromagnetic fields (EMF), and various forms of malignant pathologies. A foundational pillar of this modern epidemiological consensus is detailed in the comprehensive review titled *Cancer epidemiology update, following the 2011 IARC evaluation of radiofrequency electromagnetic fields (Monograph 102)*.⁴⁴

This pivotal paper systematically evaluates numerous human case-control studies, identifying a consistent, statistically significant association between prolonged wireless phone use and aggressive intracranial malignancies like glioma. By contrasting the superior exposure tracking of case-control designs against the systemic exposure misclassifications prevalent in large cohort studies, the authors conclude that the cumulative data since the 2011 International Agency for Research on Cancer (IARC) Group 2B classification is now strong enough to classify RF radiation as a definitive Group 1 human carcinogen.

⁴⁴ Miller, A. B., Morgan, L. L., Udasin, I., & Davis, D. L. (2018). Cancer epidemiology update, following the 2011 IARC evaluation of radiofrequency electromagnetic fields (Monograph 102). *Environmental Research*, 167, 673–683. https://ec.europa.eu/health/scientific_committees/scheer/docs/emf2022/Cancer_epidemiology_update_Miiller_et_al_2018.pdf

This call for an immediate regulatory upgrade is reinforced by institutional presentations and public testimony from its lead researchers. In the recorded expert presentation titled *Dr. Miller: The body of evidence linking cell phone and wireless to cancer*, Dr. Anthony Miller expands upon these human data trends by synthesizing historical case-control data—such as the international Interphone study and France's CERENAT trial. He emphasizes that human observational data demonstrates a multi-fold increased risk of glioblastoma multiforme (the most malignant form of brain cancer) and vestibular schwannoma (acoustic neuroma) following extended usage windows, particularly when exposures begin early in childhood development. Dr. Miller explicitly demonstrates that when this human data is combined with the high-level animal toxicology data produced by the U.S. National Toxicology Program (NTP), public health agencies have sufficient proof of causation to transition immediately from a stance of mere precaution to active risk prevention.⁴⁵

Further expanding the geographic and bodily scope of these findings, recent prospective and site-specific studies link wireless device proximity to non-neurological malignancies. In the large-scale analysis titled *Mobile Phone Use and Risks of Overall and 25 Site-specific Cancers: A Prospective Study from the UK Biobank Study*, researchers utilized a massive population dataset to cross-examine general cellular phone usage habits against broad cancer outcomes.⁴⁶

Concurrently, pioneering oncological research has focused heavily on specific structural exposure zones where personal devices are held or carried directly against the body. Investigating the long-term impacts of direct pelvic proximity, the study titled *Use of Mobile and Cordless Phones and the Association with Prostate Cancer* evaluates how localized, close-range emissions from mobile hardware and cordless phones relate to the development of urological malignancies, challenging the adequacy of industry-favored whole-body exposure averages.⁴⁷

Beyond personal communication devices, heavy infrastructure elements like macro cell towers and radar systems represent a severe source of chronic, continuous public exposure. In the comprehensive review titled *Long-term exposure to microwave radiation provokes cancer growth: Evidences from radars and mobile communication systems*, researchers compiled extensive data demonstrating that continuous, low-

⁴⁵ Environmental Health Trust. (2019, March 20). *Dr. Miller: The body of evidence linking cell phone and wireless to cancer* [Video]. YouTube. <https://www.youtube.com/watch?v=1OITb3CrXNE>

⁴⁶ Zhang, Y., Zhang, Y., Ye, Z., Yang, S., Liu, M., Wu, Q., Zhou, C., He, P., Gan, X., & Qin, X. (2023). Mobile Phone Use and Risks of Overall and 25 Site-specific Cancers: A Prospective Study from the UK Biobank Study. *Cancer Epidemiology, Biomarkers & Prevention*, OF1–OF8. <https://doi.org/10.1158/1055-9965.epi-23-0766>

⁴⁷ Hardell, L., & Carlberg, M. (2025). Use of Mobile and Cordless Phones and the Association with Prostate Cancer. *Fortune Journal of Health Sciences*, 8(2), 267–273. <https://doi.org/10.26502/fjhs.272>

intensity microwave radiation from base stations and military hardware acts as a powerful promoter of tumor growth.⁴⁸

This structural risk is empirically verified in the extensive South American epidemiological study titled *The Effect of Continuous Low-Intensity Exposure to Electromagnetic Fields from Radio Base Stations to Cancer Mortality in Brazil*.⁴⁹ By mapping the spatial distribution of cellular base stations against municipal health records, this study documents an alarming correlation between residential proximity to transmitting infrastructure and elevated rates of cancer mortality, demonstrating that ambient environmental RF/EMF poses a systemic threat to surrounding populations.

The technical and regulatory implications of these cumulative infrastructure hazards are examined in the investigative broadcast titled *Cell towers are NOT safe - the scientific evidence w/ Nick Pineault*.⁵⁰ This analytical review highlights how current public safety standards remain dangerously anchored in obsolete, short-term thermal metrics derived from data collected in the 1980s. Pineault showcases testimony from top-tier institutional scientists who openly acknowledge that these legacy regulations completely mask the intense, highly bioactive peak microbursts of modern signal architectures like 5G. The peer-reviewed literature presented establishes that continuous exposure to ambient cellular infrastructure erodes cellular defenses, drives DNA double-strand breaks, and functions as an undeniable environmental carcinogen far below our current public exposure limits.

Comprehensive Overview of Human Health Effects Triggered by Wireless Radiation

The massive proliferation of artificial electromagnetic fields (EMF) since 1990 has radically transformed the Earth's environmental baseline, initiating widespread, multi-system chronic disease across the global population. Decades of peer-reviewed animal toxicology and human epidemiological research demonstrate that low-intensity, *non-thermal* wireless radiation acts as a powerful environmental pollutant. This section

⁴⁸ I Yakymenko, E Sidorik, S Kyrylenko, & V Chekhun. (2011). Long-term exposure to microwave radiation provokes cancer growth: Evidences from radars and mobile communication systems. *Experimental Oncology*, 33(2), 62–70. https://www.researchgate.net/publication/51454770_Long-term_exposure_to_microwave_radiation_provokes_cancer_growth_Evidences_from_radars_and_mobile_communication_systems

⁴⁹ Pinheiro, C., Adilza Condessa Dode, Kramer, M., O'Dwyer, G., Leite, D., Ines, Rodrigues, R., Vera Cecilia Frossard, & Saraiva, T. (2021). The Effect of Continuous Low-Intensity Exposure to Electromagnetic Fields from Radio Base Stations to Cancer Mortality in Brazil. *International Journal of Environmental Research and Public Health*, 18(3), 1229–1229. <https://doi.org/10.3390/ijerph18031229>

⁵⁰ The EMF Guy. (2024, October 16). Cell towers are NOT safe - the scientific evidence w/ Nick Pineault [Video]. YouTube. <https://www.youtube.com/watch?v=DXuIXnIC75g>

organizes the definitive literature into key systemic topics, explicitly documenting the pathogenic impacts of modern wireless infrastructure on human biology.

1) Systemic Pathologies, Chronic Diseases, and Global Scientific Declarations

- **International Appeal: Scientists call for Protection from Non-ionizing Electromagnetic Field Exposure:** The international independent research community issued a permanent collective warning titled *International Appeal: Scientists call for Protection from Non-ionizing Electromagnetic Field Exposure*.⁵¹ Signed by hundreds of credentialed EMF scientists who have published peer-reviewed literature, the declaration explicitly declares that current guidelines fail to protect the public—especially children and pregnant women—from documented genetic, neurological, and reproductive harms.
- **BioInitiative Report 2012:** A comprehensive source of *non-thermal* biological damage is the 1,540-page text titled *BioInitiative Report 2012: A Rationale For Biologically-based Exposure Standards for Low-intensity Electromagnetic Radiation*.⁵² Based upon thousands of peer-reviewed molecular papers, it establishes that low-intensity wireless infrastructure induces systemic inflammation, breaks down the blood-brain barrier, and prompts malignant cellular proliferation, and more.
- **Adverse Effects of Wireless Radiation (textbook):** This vast independent literature is unified into a comprehensive toxicological index in the e-textbook titled *Adverse Effects of Wireless Radiation*, available free online.⁵³ Backed by thousands of meticulous references, this master monograph documents that modern wireless telecommunications function as an unregulated, multi-system public health threat that compromises human biological integrity.
- **Safety of Wireless Technologies: The Scientific View:** In the thorough monograph titled *Safety of Wireless Technologies: The Scientific View*, a retrospective analysis of the 1971 U.S. Navy radiation database is performed.⁵⁴ The authors demonstrate that out of 36 chronic, non-communicable conditions

⁵¹ EMFscientist.org - International EMF Scientist Appeal. (n.d.). Emfscientist.Org. Retrieved September 28, 2026, from <https://emfscientist.org/index.php/emf-scientist-appeal>

⁵² bioinitiative.org. (2012, November 8). *BioInitiative Report 2012: A Rationale For Biologically-based Exposure Standards for Low-intensity Electromagnetic Radiation*. Bioinitiative.Org. <https://bioinitiative.org/table-of-contents/>

⁵³ Kostoff, Ph.D., R. N. (2019). *Adverse Effects of Wireless Radiation*. <https://www.cga.ct.gov/2021/etdata/tmy/2021HB-06442-R000309-Lynch,%20Margaret-Exhibit%20N-TMY.PDF>

⁵⁴ Lear, R. A., & Rees, C. R. G. (2025). *Safety of Wireless Technologies: The Scientific View*. <https://electromagnetichealth.org/wp-content/uploads/2025/02/Safety-of-Wireless-Technologies-Ver5-020525.pdf>

that more than doubled in the United States between 1990 and 2015, the early military literature explicitly predicted and warned of 23 of them.

- **Health Effects of Electromagnetism.:** The primary physics governing these interactions are described in the academic university text titled *Health Effects of Electromagnetism*.⁵⁵ This work establishes that because humans operate as highly sensitive bioelectrical systems, ambient exposures inevitably generate destructive structural interactions with the natural millivolt potentials of our cells.
- **Former WHO Director General Gro Harlem Brundtland: “No doubt there are health effects from mobile phone radiation”:** This 2015 article captures a rare instance where a former prime minister and international agency director directly confirms that mobile device exposure drives unequivocal neurological and systemic damage, and that she is *personally* affected by exposure to cell phones.⁵⁶
- **Risks to health and well-being from radio-frequency radiation emitted by cell phones and other wireless devices:** Coordinating multi-national data, the comprehensive epidemiological analysis titled *Risks to health and well-being from radio-frequency radiation emitted by cell phones and other wireless devices* details how chronic device proximity impairs fetal neurodevelopment, degrades human sperm quality, and permanently damages public health.⁵⁷
- **Is your mobile phone destroying your digestion?:** Investigating the hidden damage inflicted upon internal ecosystems, the specialized report titled *Is your mobile phone destroying your digestion? The EMF-Microbiome interaction* explores how close-range device placement alters the delicate human gut microbiome, driving localized epithelial dysfunction, leaky gut patterns, and chronic internal inflammation.⁵⁸

2) Effects on the Brain and Neurodegenerative Pathologies

⁵⁵ Heroux, P. (2019). *Health Effects of Electromagnetism*. McGill University. <https://ehtrust.org/wp-content/uploads/Health-Effects-of-ElectroMagnetism-2019.pdf>

⁵⁶ Swedish Radiation Protection Organization. (2015, August 27). *Former WHO Director General Gro Harlem Brundtland: “No doubt there are health effects from mobile phone radiation”*. Strålskyddsstiftelsen. <https://www.stralskyddsstiftelsen.se/2015/08/27/former-who-director-general-gro-harlem-brundtland-no-doubt-there-are-health-effects-from-mobile-phone-radiation/>

⁵⁷ Miller, A. B., Sears, M. E., Morgan, L. L., Davis, D. L., Hardell, L., Oremus, M., & Soskolne, C. L. (2019). Risks to health and well-being from radio-frequency radiation emitted by cell phones and other wireless devices. *Frontiers in Public Health*, 7(223). <https://doi.org/10.3389/fpubh.2019.00223>

⁵⁸ Overton, E. (2018, July 24). *Is your mobile phone destroying your digestion? The EMF-Microbiome interaction*. Eonutrition. <https://www.eonutrition.co.uk/post/is-your-mobile-phone-destroying-your-digestion-the-emf-microbiome-interaction>

The central nervous system is profoundly sensitive to *non-thermal* electromagnetic fields, as documented in this series of neurological, genotoxic, and structural brain studies:

- **Permanent Nerve Cell Damage from Acute Exposure:** Neurological damage is documented in the rodent study titled *Nerve cell damage in mammalian brain after exposure to microwaves from GSM mobile phones*.⁵⁹ The researchers documented that just a single, two-hour exposure to a mobile phone during a mammal's lifetime—even when the output power of the phone was experimentally reduced 100-fold—caused permanent, highly visible nerve cell damage and brain tissue necrosis. This study highlights the severe vulnerability of developing children's brains (who have much thinner skulls than adults) to ambient wireless devices.
- **Deoxyribonucleic Acid (DNA) Damage and Brain Genotoxicity:** The direct destruction of genetic and neuronal material is verified across multiple independent animal toxicology trials:
 - o The genotoxic evaluation titled *Detection of low level microwave radiation induced deoxyribonucleic acid damage vis-à-vis genotoxicity in brain of fischer rats* reveals clear, low-level microwave induction of DNA breaks inside mammalian brain structures.⁶⁰
 - o The analysis titled *Mutagenic response of 2.45 GHz radiation exposure on rat brain* demonstrates that common consumer frequencies (such as standard Wi-Fi and Bluetooth bands) induce distinct mutagenic anomalies within cortical tissues.⁶¹
 - o The molecular testing outlined in *Single strand DNA breaks in rat brain cells exposed to microwave radiation* systematically confirms immediate single-strand structural damage following short-term exposure.⁶²

⁵⁹ Salford, L. G., Brun, A. E., Eberhardt, J. L., Malmgren, L., & Persson, B. R. R. (2003). Nerve cell damage in mammalian brain after exposure to microwaves from GSM mobile phones. *Environmental Health Perspectives*, 111(7), 881–883; discussion A408. PubMed Central. <https://doi.org/10.1289/ehp.6039>

⁶⁰ Banerjee, B., Ahmed, R., Chandna, S., Abegaonkar, M., Tripathi, A., Deshmukh, P., & Megha, K. (2013). Detection of low level microwave radiation induced deoxyribonucleic acid damage vis-à-vis genotoxicity in brain of fischer rats. *Toxicology International*, 20(1), 19. <https://pmc.ncbi.nlm.nih.gov/articles/PMC3702122/>

⁶¹ Kesari, K. K., Behari, J., & Kumar, S. (2010). Mutagenic response of 2.45 GHz radiation exposure on rat brain. *International Journal of Radiation Biology*, 86(4), 334–343. <https://pubmed.ncbi.nlm.nih.gov/20353343/>

⁶² Paulraj, R., & Behari, J. (2006). Single strand DNA breaks in rat brain cells exposed to microwave radiation. *Mutation Research - Fundamental and Molecular Mechanisms of Mutagenesis*, 596(1–2), 76–80. <https://www.ursi.org/proceedings/procGA08/papers/K02bp2.pdf>

- **The Historical Benchmarks of Strand-Break Genotoxicity:** This mechanical chain of causation is anchored by laboratory investigations conducted by Dr. Henry Lai and Dr. Narendra Singh. Their first publication, titled *Acute low-intensity microwave exposure increases DNA single-strand breaks in rat brain cells*, provided the initial global proof that low-intensity fields directly break down neurological DNA.⁶³

They subsequently confirmed and expanded these insights in their follow-up milestone paper, titled *Single-and double-strand DNA breaks in rat brain cells after acute exposure to radiofrequency electromagnetic radiation*, proving that both single- and lethal double-strand breaks occur inside the mammalian brain following acute radiation exposure.⁶⁴

3) Effects on the Heart, Blood Parameters, and Autonomic Regulation

The human cardiovascular, circulatory and autonomic nervous systems react acutely to wireless exposures, displaying profound electrical, cellular, and stress-induced changes:

- **Breaking study: Living near a cell tower linked to white blood cell elevation comparable to smoking:** In the contemporary reporting titled *Breaking study: Living near a cell tower linked to white blood cell elevation comparable to smoking*, independent medical researchers reveal an immediate, defensive immunological reaction in humans chronically exposed to neighborhood cell towers.⁶⁵ This macro-analysis is supported by the comprehensive clinical trial titled *Effects of exposure to nearby mobile phone base stations and mobile phone usage on human blood parameters*.⁶⁶ This high-precision study demonstrates that ambient base-station proximity triggers statistically significant, negative alterations across human blood profiles, forcing abnormal cell morphology and chronic systemic stress, health effects similarly seen in smokers.

⁶³ Lai, H., & Singh, N. P. (1995). Acute low-intensity microwave exposure increases DNA single-strand breaks in rat brain cells. *Bioelectromagnetics*, 16(3), 207–210. <https://doi.org/10.1002/bem.2250160309>

⁶⁴ LAI, H. (1996). Single-and double-strand DNA breaks in rat brain cells after acute exposure to radiofrequency electromagnetic radiation. *International Journal of Radiation Biology*, 69(4), 513–521. https://www.researchgate.net/publication/14573695_Single-_and_double-strand_DNA_breaks_in_rat_brain_cells_after_acute_exposure_to_radiofrequency_electromagnetic_radiation

⁶⁵ Hulscher, N. (2026, March 4). *Breaking study: Living near a cell tower linked to white blood cell elevation comparable to smoking*. FOCAL POINTS (Courageous DiscourseTM). Thefocalpoints.Com. <https://www.thefocalpoints.com/p/breaking-study-living-near-a-cell>

⁶⁶ Laldinpuii, Sailo, L., Weller, S., Varte, C. L., Tochhawng, L., Bandara, P., McCredden, J. E., & Zothansiam. (2026). Effects of exposure to nearby mobile phone base stations and mobile phone usage on human blood parameters. *Electromagnetic Biology and Medicine*, 45(3), 231–250. <https://doi.org/10.1080/15368378.2026.2623473>

- **Cardiac Effects of Radiofrequency Radiation:** The direct physiological mechanisms disrupting cardiac tissue are systematically categorized by medical monitoring groups in the technical reference index titled *Physicians for Safe Technology | Cardiac Effects of Radiofrequency Radiation*.⁶⁷ This resource tracks how ambient microwave exposures directly alter the electrical conduction pathways of the human heart, leading to myocardial stress, lipid profile changes, and irregular cardiac rhythms.
- **Autonomic Disruption and Blood Aggregation:** Acute cardiac risks are clinically verified in the master cardiovascular study titled *Radiation from wireless technology affects the blood, the heart, and the autonomic nervous system*.⁶⁸ Through continuous heart-rate variability (HRV) and real-time live blood monitoring, Dr. Magda Havas proves that 2.4 GHz wireless signals *instantly* disrupt the human autonomic nervous system, provoking immediate tachycardia or arrhythmia in sensitive individuals. Furthermore, her work visually documents a massive, immediate aggregation of red blood cells into dense "rouleaux" formations upon exposure, drastically thickening blood viscosity and significantly elevating long-term vascular and clotting risks.
- **Mobile Phone Usage and New-Onset Hypertension:** A large-scale prospective study titled *Mobile phone calls, genetic susceptibility, and new-onset hypertension: Results from 212,046 UK biobank participants*, tracking over 200,000 participants over a median 12-year period, demonstrates a direct dose-response relationship between weekly mobile phone call duration and new-onset hypertension.⁶⁹
- **Smartphone Radiation and Blood Component Degradation:** Controlled laboratory trials confirm that common consumer hardware induces immediate, detrimental changes to human blood at a cellular level. In the experimental study *Acute effects of 30 minutes of exposure to a smartphone call on in vitro platelet function*, researchers exposed healthy whole blood samples to a standard 900 MHz commercial transmission for a brief 30-minute window.⁷⁰

⁶⁷ mdsafetech.org. (2018, April 11). Physicians for Safe Technology | Cardiac Effects of Radiofrequency Radiation. Physicians for Safe Technology. <https://mdsafetech.org/cardiac-effects-of-radiofrequency-radiation/>

⁶⁸ Havas, M. (2013). Radiation from wireless technology affects the blood, the heart, and the autonomic nervous system). *Reviews on Environmental Health*, 28(2–3). https://www.researchgate.net/publication/258313941_Radiation_from_wireless_technology_affects_the_blood_the_heart_and_the_autonomic_nervous_system

⁶⁹ Ye, Z., Zhang, Y., Zhang, Y., Yang, S., Liu, M., Wu, Q., Zhou, C., He, P., Gan, X., & Qin, X. (2023). Mobile phone calls, genetic susceptibility, and new-onset hypertension: Results from 212,046 UK biobank participants. *European Heart Journal - Digital Health*, 4(3). <https://doi.org/10.1093/ehjdh/ztad024>

⁷⁰ Lippi, G., Danese, E., Brocco, G., Gelati, M., Salvagno, G. L., & Montagnana, M. (2017). Acute effects of 30 minutes of exposure to a smartphone call on in vitro platelet function. *Blood Transfusion = Trasfusione Del Sangue*, 15(3), 249–253. PubMed Central. <https://doi.org/10.2450/2016.0327-15>

The *non-thermal* exposure triggered a highly significant 5% increase in mean platelet volume (MPV) alongside a 10% prolongation in clotting closure time—the biological hallmarks of "exhausted platelets." This immediate structural perturbation led the authors to warn that harvested blood products must be stored completely isolated from smartphones to prevent transfusing healthcare patients with compromised, metabolically spent blood elements.

Vulnerabilities in Pediatric Development, Prenatal Health, and Transgenerational Genetics

- **Non-Thermal Risks to Developing Pediatric Physiology:** The proliferation of personal communication tech has subjected pediatric populations to unprecedented baselines of chronic radiation, introducing critical health vulnerabilities. In the comprehensive review paper titled *On the Clear Evidence of the Risks to Children from Smartphone and WiFi Radio Frequency Radiation*, research refutes legacy thermal safety standards by demonstrating that non-ionizing microwave radiation triggers profound cellular damage, neurological disruption, and altered brain tissue development in children.⁷¹

Because their skull bones are thinner and their organs are rapidly dividing, children absorb significantly higher percentages of energy than adults, accelerating long-term clinical risks. This structural vulnerability is further synthesized in the pediatric clinical review titled *Health effects of electromagnetic fields on children*, which compiles extensive literature tracking the direct correlation between childhood ambient electromagnetic radiation exposure and systemic behavioral, sleep, and neurodevelopmental conditions.⁷²

- **Quantitative Dose Tracking within Educational Environments:** Evaluating real-world radiation parameters is vital to understanding the true environmental dosage children absorb during the school day. To resolve this data gap, the field investigation titled *Measurements of radiofrequency radiation with a body-borne exposimeter in Swedish schools with Wi-Fi* utilized body-borne exposimeter hardware worn continuously by students to capture real-time, personal exposure metrics throughout active school hours.⁷³

⁷¹ Butler, T. (2019). *On the Clear Evidence of the Risks to Children from Smartphone and WiFi Radio Frequency Radiation*. https://www.jrseco.com/wp-content/uploads/On-the-Clear-Evidence-of-the-Risks-to-Children-from-Smartphone-and-WiFi-Radio-Frequency-Radiation_Final.pdf

⁷² Moon, J.-H. (2020). Health effects of electromagnetic fields on children. *Clinical and Experimental Pediatrics*, 63(11), 422–428. <https://pmc.ncbi.nlm.nih.gov/articles/PMC7642138/>

⁷³ Hedendahl, L. K., Carlberg, M., Koppel, T., & Hardell, L. (2017). Measurements of radiofrequency radiation with a body-borne exposimeter in Swedish schools with Wi-Fi. *Frontiers in Public Health*, 5. <https://doi.org/10.3389/fpubh.2017.00279>

The quantitative measurements revealed that commercial school-wide Wi-Fi networks and peer-to-peer mobile devices create highly irregular, intense radiation bursts. This study proves that relying on static room measurements dramatically underestimates the cumulative daily biological dose received by young students, emphasizing the urgent need for hardwired local networks to preserve pediatric safety zones.

- **Prenatal Exposure Risks and Transgenerational Genetic Implications:** Involuntary environmental exposures during fetal development introduce severe risks that can permanently alter the human evolutionary timeline. The localized impact on neurological control is empirically documented in the clinical trial titled *Effect of mobile phone usage duration during pregnancy on the general motor movements of infants*, which demonstrates a clear correlation between the duration of maternal mobile device use and abnormal general motor movement patterns in newborn infants.⁷⁴

Mechanistic Pathways of Anthropogenic Fields, Regulatory Inadequacies, and the Clinical Manifestations of 5G Radiation

- **The Official European Parliament Study:** Titled *Health impact of 5G: Current state of knowledge of 5G-related carcinogenic and reproductive/developmental hazards as they emerge from epidemiological studies and in vivo experimental studies*, this study represents a comprehensive narrative and scoping review commissioned by the Panel for the Future of Science and Technology (STOA).⁷⁵

Authored by Dr. Fiorella Belpoggi of the Ramazzini Institute, this 2021 document serves as an institutional background report to assist EU policymakers by synthesizing decades of peer-reviewed human and animal data on RF/EMF. The study separates 5G into two spectral bands, concluding that exposure to lower frequencies (450 to 6,000 MHz) is "probably carcinogenic to humans" (specifically associated with gliomas and acoustic neuromas) and clearly harms male fertility.

The report highlights a critical public safety gap regarding next-generation higher frequencies (24 to 100 GHz millimeter waves), finding no adequate biomedical studies on their *non-thermal* health impacts and ultimately advocating for a

⁷⁴ Bektas, H., Bektas, M. S., & Dasdag, S. (2022). Effect of mobile phone usage duration during pregnancy on the general motor movements of infants. *Biotechnology & Biotechnological Equipment*, 36(1), 57–67. <https://www.tandfonline.com/doi/epdf/10.1080/13102818.2022.2046505>

⁷⁵ European Parliament. (2021). *Health impact of 5G: Current state of knowledge of 5G-related carcinogenic and reproductive/developmental hazards as they emerge from epidemiological studies and in vivo experimental studies*. [https://www.europarl.europa.eu/RegData/etudes/STUD/2021/690012/EPRS_STU\(2021\)690012_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2021/690012/EPRS_STU(2021)690012_EN.pdf)

regulatory moratorium on high-band deployments until comprehensive preventive research is completed.

- **The Biophysical Cascade of Cellular Dysfunction:** A groundbreaking molecular review establishes that modern wireless communication technologies drive unprecedented physiological damage by indirectly ionizing biological molecules through cellular stress. In the milestone paper titled *A comprehensive mechanism of biological and health effects of anthropogenic extremely low frequency and wireless communication electromagnetic fields*, researchers outline how fully polarized, coherent, and highly variable microwave carrier waves act in tandem with extremely low frequency (ELF) and ultra-low frequency (ULF) signals.

This combination of frequencies forces mobile ions within voltage-gated ion channels (VGICs) to fluctuate irregularly, disrupting delicate intracellular ionic concentrations. This channel breakdown triggers a rapid overproduction of reactive oxygen species (ROS) via the mitochondrial electron transport chain and membrane-bound oxidases, resulting in severe oxidative stress.

Because this indirect ionization damages critical biomolecules and breaks covalent DNA bonds, it provides a comprehensive biophysical and biochemical explanation for the widespread reports of cancer, infertility, and electromagnetic hypersensitivity (EHS) associated with modern digital infrastructure.⁷⁶

- **5G Signals Contributed To Rapid Physiological Degradation After Deployment:** A macro-analysis of real-world tracking profiles confirms that advanced telecommunication signals are substantially more biologically hazardous than older wireless network iterations. The systematic review titled *Summary of seven Swedish case reports on the microwave syndrome associated with 5G radiofrequency radiation* aggregates medical logs across a cohort of subjects aged 4 to 83 years who experienced rapid physiological degradation after local network upgrades to 5G.⁷⁷

The data reveal that the most severe, unmanageable injuries target the central nervous system, characterized by profound cognitive deterioration, emotional distress, and sudden-onset sleep deprivation. Notably, the tracked children experienced the highest possible severity rating of 10 for clinical insomnia.

⁷⁶ Panagopoulos, D. J., Yakymenko, I., De Iuliis, G. N., & Chrousos, G. P. (2025). A comprehensive mechanism of biological and health effects of anthropogenic extremely low frequency and wireless communication electromagnetic fields. *Frontiers in Public Health*, 13, 1585441. PubMed Central. <https://doi.org/10.3389/fpubh.2025.1585441>

⁷⁷ Hardell, L., & Nilsson, M. (2025). Summary of seven Swedish case reports on the microwave syndrome associated with 5G radiofrequency radiation. *Reviews on Environmental Health*, 40(1), 147-157. <https://www.degruyterbrill.com/document/doi/10.1515/reveh-2024-0017/html>

Because these families had previously tolerated older wireless generations without incident, the authors conclude that modern, highly variable pulse-modulated signals possess heightened biological activity, functioning as observational provocation attacks that justify an immediate global moratorium on infrastructure rollouts.

- **5G Elicits More Pronounced Biological Effects:** Emerging data indicates that 5G frequencies elicit significantly more pronounced biological effects than legacy 3G and 4G systems. As these higher and higher frequencies scale toward the 6G spectrum, the wavelengths shrink to dimensions that approach the microscopic scale of our cells. At this threshold, the radiation can directly couple with microscopic biological structures—such as cellular membranes and sweat ducts—which have already been demonstrated to act as miniature antennas that amplify *non-thermal* harm, alter gene expression, and cause cellular destruction.

This mechanism is supported by the peer-reviewed biophysical modeling of Betzalel, Ben Ishai, and Feldman (2017) in the article titled *The human skin as a sub-THz receiver – does 5G pose a danger to it or not?*⁷⁸ Their research demonstrated that the helical geometry of human sweat ducts structurally corresponds to helical antenna parameters within the 5G millimeter-wave spectrum (24–100 GHz). Because these microscopic ducts are filled with conductive fluid, they actively resonate with mmWave signals, drawing electromagnetic energy into the skin and generating highly concentrated, localized specific absorption rates (SAR) that legacy homogeneous thermal models entirely fail to calculate.

The authors state, “*We are raising a warning flag against the unrestricted use of sub-THz technologies for communication, before the possible consequences for public health are explored.*”

- **Flawed Regulatory Assumptions and Public Health Inadequacy:** The extensive policy analysis titled *Scientific evidence invalidates health assumptions underlying the FCC and ICNIRP exposure limit determinations for radiofrequency radiation: implications for 5G* highlights that current safety limits are based on false 1980s suppositions that assume biological damage only occurs when tissue is noticeably heated.⁷⁹

⁷⁸ Betzalel, N., Ben Ishai, P., & Feldman, Y. (2018). The human skin as a sub-THz receiver – does 5G pose a danger to it or not? *Environmental Research*, 163, 208–216. <https://doi.org/10.1016/j.envres.2018.01.032>

⁷⁹ Belyaev, I., Blackman, C., Chamberlin, K., DeSalles, A., Dasdag, S., Fernández, C., Hardell, L., Héroux, P., Kelley, E., Kesari, K., Maisch, D., Mallery-Blythe, E., Melnick, R. L., Miller, A., Moskowitz, J. M., Sun, W., & Yakymenko, I. (2022). Scientific evidence invalidates health assumptions underlying the FCC and ICNIRP exposure limit determinations for radiofrequency radiation: implications for 5G. *Environmental Health*, 21(1). <https://doi.org/10.1186/s12940-022-00900-9>

The authors review 25 years of extensive research, concluding that adverse effects observed at exposures below the levels assumed to be "safe" include *non-thermal* induction of reactive oxygen species, DNA damage, cardiomyopathy, carcinogenicity, sperm degradation, and neurological effects, including electromagnetic hypersensitivity (EHS). Also, multiple human studies have found statistically significant associations between RFR exposure and increased brain and thyroid cancer risk.

The authors state that revised health protective exposure limits for humans and the environment are urgently needed, and that these limits must be based on scientific evidence rather than on erroneous assumptions, especially given the increasing worldwide exposures of people and the environment to RF/EMF, including novel forms of radiation from 5G telecommunications for which there are no adequate health effects studies.

- **The Global Consensus and Scientific Appeals:** As compiled in the public documentation page titled *Small Cells, Mini Cell Towers, Wireless Facilities, and Health: Letters From Scientists on the Health Risk of 5G*, hundreds of open letters, expert testimonies, and formal appeals from international scientists are calling for greater health protection from EMF exposure, and the need for more studies on health and the environment before deploying 5G technology.⁸⁰ Unfortunately, the warning fell on deaf ears, since 5G was ultimately deployed.

These unified public declarations argue that multiplying the number of local transmitters near homes and schools dramatically increases ambient radiation loads, creating an environment that has never been tested for safety. The independent scientific community aggressively calls for independent health and environmental impact studies before the public is subjected to inescapable, multi-frequency small cell exposure loops.

- **Acute Symptom Onset Following Local Infrastructure Rollout:** A ground-breaking clinical evaluation demonstrates that the rapid activation of neighborhood antenna arrays caused immediate, severe microwave sickness in previously healthy individuals. In the clinical study titled *Case Report: The Microwave Syndrome after Installation of 5G Emphasizes the Need for Protection from Radiofrequency Radiation*, researchers track acute somatic reactions following the installation of cellular arrays directly outside residential dwellings.⁸¹

Extreme peak maximum radiation bursts reaching between 2,500,000 and 3,180,000 $\mu\text{W}/\text{m}^2$ were documented inside local bedrooms—parameters that drastically exceed independent, *non-thermal* medical safety limits. Following

⁸⁰ <https://ehtrust.org/small-cells-mini-cell-towers-health-letters-scientists-health-risk-5g/>

⁸¹ Case Report: The Microwave Syndrome after Installation of 5G Emphasizes the Need for Protection from Radiofrequency Radiation. (2023). *Annals of Case Reports*, 8(1). <https://doi.org/10.29011/2574-7754.101112>

activation, exposed residents immediately developed intense neurological conditions, including persistent headaches, chronic fatigue, severe concentration deficits, nosebleeds, and skin-burning sensations.

Crucially, these debilitating symptoms quickly declined or vanished entirely when the affected individuals left their homes or traveled to environments with lower ambient RF, demonstrating a clear environmental cause and effect.

Measuring Human Exposure and Public Health Surveillance

7. What scientific methods are currently available for accurately characterizing individual and population-level RF radiation exposure?

To accurately characterize individual and population-level radiofrequency (RF) radiation exposure, it is imperative that scientific methodologies transition away from static, theoretical models, and instead utilize real-time, dynamic tracking. The premier methodologies currently available include:

Body-Borne Exposimeter Tracking:

Rather than relying on stationary room measurements, which dramatically underestimate cumulative biological doses, modern field studies utilize wearable, body-borne exposimeters worn continuously by individuals. As demonstrated in the landmark investigation *Measurements of radiofrequency radiation with a body-borne exposimeter in Swedish schools with Wi-Fi*, these devices capture real-time, personal exposure metrics across highly variable real-world movement profiles (see Footnote 73).

This method successfully isolates the highly irregular, intense radiation bursts generated by local Wi-Fi networks and peer-to-peer mobile devices that static area meters miss completely.

Personal Dosimetry & Time-Averaged Waveform Logging:

Advanced personal dosimeters capture not just raw power density, but the specific behavior of complex signals. This allows researchers to track peak spatial specific absorption rates (psSAR) alongside critical signal characteristics, including pulse-modulated data bursts, low-frequency carrier wave modulations, and rapid amplitude variations.

Finite-Difference Time-Domain (FDTD) Computational Simulations:

At a population and anatomical level, scientists can employ highly detailed anthropomorphic computer models combined with FDTD simulations. This methodology allows for precise, non-invasive mapping of how different age groups and tissue types (such as the thinner skull bones and higher-conductivity brain tissues of developing children) physically absorb RF energy relative to adult biometrics.

8. What, if any, improvements in exposure assessment methodologies are needed to better evaluate real-world exposure conditions?

To accurately evaluate the biological consequences of modern telecommunications, exposure assessments must evolve beyond static environmental modeling. Current methodologies require critical improvements in tracking cumulative metrics, isolating signal characteristics, and utilizing remediation-based clinical study designs.

Dynamic Cumulative & Waveform-Specific Dosimetry

- Multi-Frequency Cumulative Tracking:

Exposure assessments must shift from evaluating single-device metrics to logging the cumulative, ambient inundation experienced in real-world settings. Assessments must capture total daily dosage across the entire active spectrum simultaneously (i.e. matching the densified arrays of smart-home appliances and IoT devices, cell phones, Wi-Fi, vehicular transmitters, wearable tech, etc.).

- Waveform and Modulation Characterization:

Measuring simple time-averaged power density or Specific Absorption Rate (SAR) is biologically irrelevant. Methodologies must be updated to explicitly log the precise structural parameters of a particular signal, including its specific waveform, pulse-modulation rates, and low-frequency amplitude variability—which are the primary drivers of biological activity and Voltage-Gated Ion Channel (VGIC) disruption.⁸²

Standardization of Units of RF/EMF Intensity in $\mu\text{W}/\text{m}^2$

An enormous problem with *all* the research articles I review are inconsistent and non-standardized units used to measure RF intensities. The scientific community appears to completely lack a universally standardized unit for exposure reporting, making direct cross-study comparisons impossible without first performing mathematical computations to convert the units. Because the U.S. standards for exposure are currently set to permit such high intensities of RF/EMF, many of the studies are performed at these currently legal levels as well, which is from where the units issue stems.

For intensities approaching the currently legal limits, it makes sense to use units like milliwatts per square centimeter (mW/cm^2). However, *microwatts* per square meter $\mu\text{W}/\text{m}^2$ are the units that make the most sense when setting the appropriate biologically-based standards, and are the same units used by the frameworks prepared by the BioInitiative, Building Biology (SBM) or EUROPAEM frameworks, discussed on pg. 39. To put the math into perspective, $10 \mu\text{W}/\text{m}^2$ is equal to $0.000001 \text{ mW}/\text{cm}^2$, so it wouldn't

⁸² Panagopoulos, D. J., Karabarbounis, A., Yakymenko, I., & Chrousos, G. P. (2021). Human-made electromagnetic fields: Ion forced-oscillation and voltage-gated ion channel dysfunction, oxidative stress and DNA damage (review). *International Journal of Oncology*, 59(5), 1–16. <https://doi.org/10.3892/ijo.2021.5272>

make sense to use mW/cm² and have all those zeros to contend with when trying to interpret a study.

Even more confusing is that some studies use decibels (dB) or volts per square meter (V/m²) to measure intensities, which are legitimate units, but not useful at all when measuring intensities as low as necessary to protect the public and other living organisms in our environment. The need for standardized units of $\mu\text{W}/\text{m}^2$ for all future studies is obvious and long overdue.

Refining Laboratory Protocol and Ensuring Absolute Environmental Controls

Having examined countless animal studies relating to the biological and health effects of RF/EMF, I have come across some needed improvement to their methods. I have identified an issue whereby some researchers are not using high-precision RF meters to verify and record the actual, real-time exposure intensities inside the animal enclosures at *any* time during the experiment. One study I examined, in which rats were exposed to a network router, referred to the meter used as an “Electromagnetic Radiation Tester,” and it was used only to confirm *frequency* stability, and not *intensity* stability, which is completely inadequate for capturing biological dosing considering a router's output fluctuates wildly depending on the immediate volume of data packet traffic being sent and received.

Some laboratory setups could improve upon accurately reflecting human exposure realities. One study placed animal cages a mere 20 cm away from a live wireless router, claiming this was in order to “mimic real-world Wi-Fi usage.” However, this would actually represent an extreme, highly concentrated exposure scenario. I doubt most humans are maintaining their bodies 20 cm from active routers on a daily basis. If they are, they’re no doubt going to be suffering some major health effects.

One of the studies I reviewed even relied on aluminum foil to line laboratory walls, which is an insufficient RF barrier for what is supposed to be a rigorous science experiment. Without professional electromagnetic shielding mitigation, strong external cell tower signals can easily penetrate the study building, completely invalidating the “unexposed” control group.

Furthermore, a failure to actively map the RF and EMF around the laboratory site means control animals are frequently exposed to unlogged background variables, such as building walls containing live electrical wiring, hidden smart meters, or adjacent furnace and HVAC motors, which are all potential sources of biological disruption. Any one of these could completely invalidate the experiment—particularly if the control animals were housed in a separate wing of the building, exposed to confounding electromagnetic field stressors that ended up being absent from the experimental group.

To establish absolute scientific controls for animal experiments, future protocols need to account for the reality that RF signals are highly unstable. Audio-spectrum RF meter sweeps routinely confirm that ambient fields fluctuate aggressively within a single room, presenting stronger baselines near windows, thin building materials, or at higher structural elevations where cell towers maintain direct line-of-sight.

Within a laboratory, a single reflective object or a resonant metal cage wall can create a localized hot spot, forcing one animal to absorb a radically stronger dose than the subject next to it. Researchers cannot simply place consumer hardware (like an active cell phone) into a cage, as modern mobile devices automatically amplify their power output by orders of magnitude if the local cell tower signal drops. A phone inside a metal cage would be *blasting* its signal, sensing that its signal was being impeded.

To control for environmental variables, professional multi-frequency RF meters, or ideally, a spectrum analyzer, must be used during initial room configuration. Independent passive dosimeters should then be integrated into each cage or attached to every human participant. This tracking is essential to conclusively verify that all experimental subjects receive a strictly uniform, measured dose, while ensuring the control group remains in a genuinely radiation-free environment.

Furthermore, a basic EMF meter capable of measuring building-level AC electric and magnetic fields is imperative. This device will monitor for Extremely Low Frequencies (ELFs) stemming from internal wiring, magnetized water pipes, and similar infrastructure to rule out localized field variations across the room.

Beyond Animal Models: *In Vitro* Alternatives in RF/EMF Research

Existing studies have already pushed animal subjects to their limits, clearly demonstrating how RF/EMF affects every major biological system, especially the brain, heart, and reproductive organs. Rather than replicating these findings, a process historically marred by documented laboratory cruelty, we should glean what we need from the vast catalog of existing data.

My commitment to this minimization of animal research stems from my time earning my Bachelor's Degree in Biology, where a mandatory Animal Physiology course required us to conduct multiple, callous, terminal experiments on live animals (some of which were the same species I'd kept as pets in the past). These "experiments" had been repeated by previous students hundreds of times, and the results were already well documented by professional researchers for many years. To advance scientifically and ethically, we have to depart from these legacy institutional practices and transition to non-animal alternatives.

Transitioning to sophisticated *in vitro* models allows researchers to bypass animal cruelty while gaining a closer look at the cellular mechanisms which need further study. Modern cell cultures can be exposed to controlled RF/EMF fields to observe real-time changes in cellular metabolism, such as fluctuations in adenosine triphosphate (ATP) production, glucose uptake, and mitochondrial respiration rates.

Furthermore, high-throughput assays (HTAs, highly automated laboratory testing methods that allow scientists to rapidly screen and analyze thousands of chemical, genetic, or cellular samples simultaneously) can track the precise activation of oxidative stress pathways, looking specifically at reactive oxygen species (ROS) accumulation and DNA strand breaks. By examining these pathways at the cellular level, we can map

exact biochemical cascades triggered by electromagnetic fields without the confounding systemic variables or the ethical baggage of live animal models.

9. What, if any, technical and exposure-related information should be disclosed to consumers, residents, workers, schools, healthcare providers, and local governments?

I believe any and all technical and exposure-related information should be readily available to anyone and everyone interested in obtaining it. Federal regulators should mandate transparent, consumer-facing labels on all wireless hardware and connected infrastructure, as suggested on pg. 50.

Similar to food nutrition facts, this disclosure should feature a standardized "radiation profile" label printed directly on the product packaging, clearly detailing the device's operating frequency bands and its maximum peak power density measured in microwatts per square meter $\mu\text{W}/\text{m}^2$.

10. What data sources or surveillance systems currently exist to monitor potential adverse health effects associated with RF radiation exposure? Should additional data sources or surveillance systems be developed? Please discuss the benefits and challenges of the following data sources and surveillance systems, as relevant:

Currently, public health infrastructure relies on broad, non-specific public health databases and decentralized testing to monitor environmental hazards. No integrated, federal surveillance system currently exists specifically designed to track long-term, low-level health impacts of radiofrequency (RF) radiation. Given the universal escalation of wireless infrastructure, developing targeted data sources is highly recommended to fill critical gaps in epidemiological data.

The benefits, challenges, and structural requirements of existing and proposed surveillance frameworks are evaluated below.

a. disease registries.

- Existing Systems: National and regional registries track specific health outcomes, such as cancer (i.e., SEER program) or neurological diseases.
- Benefits: Registries provide highly accurate, standardized data regarding long-term, high-severity clinical outcomes (such as gliomas or acoustic neuromas). They offer massive sample sizes for retrospective studies.
- Challenges: Because registries do not log individual RF exposure data such as an individual's wireless usage or proximity to infrastructure, it is impossible to infer causality from a registry alone. Additionally, they completely miss subjective or early-stage symptoms like sleep disturbances, brain fog, or transient physiological changes.

b. occupational monitoring.

- Existing Systems: Programs overseen by bodies like OSHA or corporate safety officers. Industrial workers, telecommunication tower climbers, and radar engineers are periodically monitored.
- Benefits: This framework tracks "worst-case scenario" acute *thermal* exposures (i.e., RF burns or accidental high-power exposure) where dosimetry and worker location are well-documented.
- Challenges: Current medical surveillance is mostly *reactive*, focused on identifying immediate thermal damage or implant interference (i.e., pacemakers) rather than chronic, low-level *non-thermal* effects. Data is proprietary to corporations or military entities, making public health aggregation difficult.

c. environmental monitoring.

Benefits and Implementation: Environmental monitoring provides the foundational physical data required to contextualize biological outcomes. This source should be split into distinct indoor and outdoor modalities:

- Indoor Environments: Monitoring must be strictly implemented in spaces housing highly sensitive populations such as schools and hospitals. Implementing certified Electromagnetic Radiation Specialists (EMRS) to assess indoor safety can identify hidden architectural wiring errors and structural problems.⁸³ Historically, as documented in foundational literature regarding "dirty electricity," routine building inspections could identify localized harmonic distortions and transient voltages, potentially mitigating widespread chronic health symptoms and saving lives before illnesses manifest.⁸⁴
- Outdoor Environments: Long-term tracking should be deployed to study the impact of cellular base stations on local wildlife, insects, and other organisms. While the ideal methodology requires mapping an environment before an antenna is installed, finding true baseline control habitats is increasingly difficult in modern society. To resolve this, researchers can use paired-site comparisons—matching highly exposed environments with geographically similar low-radiation habitats to track differences in flora and fauna densities.

⁸³ The Building Biology Institute (BBI) offers the official Electromagnetic Radiation Specialist (EMRS) credential, which trains consultants to identify, measure, assess, and mitigate electromagnetic fields (EMFs) and electromagnetic radiation (EMR) in homes, offices, and commercial spaces.

⁸⁴ Milham, S. (2010). *Dirty electricity: Electrification and the diseases of civilization*. iUniverse.

Proposed Future Outdoor Environmental Study:

This approach builds on the Waldmann-Selsam et al. German tree study (2016)⁸⁵, which established a powerful correlation between unilateral tree crown damage and the direct line-of-sight path of mobile phone masts. To circumvent the scarcity of pre-installation data, future studies can utilize historical Google Street View photographic archives. By auditing time-lapsed street imagery containing trees or perennial vegetation, where numerous years of the area are available, researchers can objectively track chronological changes in canopy density, leaf discoloration or alterations, and overall structural degradation over the precise years following a verified small-cell or tower installation in the area.

- Challenges: Outdoor environmental monitoring would require continuous, wideband spectrum analysis to capture complex frequency modulations, which could likely be cost prohibitive.

d. longitudinal cohort studies.

- Existing Systems: Large-scale international cohort studies, such as the COSMOS study (Cohort Study on Mobile Phones and Health), track hundreds of thousands of participants over decades.
- Benefits: This is the gold standard for epidemiological research. By mapping exposure over time *before* disease onset, a long-term study involving cohorts can successfully measure health outcomes that take many years to develop, tracking both specific pathologies and general quality-of-life changes.
- Challenges: High cost, intense infrastructure requirements, and a high risk of attrition over decades. Furthermore, widespread ambient RF/EMF makes finding a true "unexposed" human control group impossible, forcing researchers to compare variations in exposure *gradients* rather than an exposed vs. unexposed baseline.

e. biomonitoring.

- Existing Systems: Primarily limited to controlled *in vitro* laboratory settings or clinical trials evaluating biomarkers of general environmental stress.
- Benefits: Biomonitoring bypasses subjective symptom reporting by measuring direct, objective physiological data. It can track real-time indicators of cellular distress,

⁸⁵ Waldmann-Selsam, C. (2016). Trees in Bamberg and Hallstadt in the radiation field of 65 mobile phone base stations: Examples from a documentation about 700 trees (2006–2016). <https://www.padrak.com/vesperman/Trees-in-Bamberg-and-Hallstadt-Documentation-2006-2016.pdf>

Waldmann-Selsam, C., Balmori-de la Puente, A., Breunig, H., & Balmori, A. (2016). Radiofrequency radiation injures trees around mobile phone base stations. *Science of The Total Environment*, 572, 554–569. <https://doi.org/10.1016/j.scitotenv.2016.08.045>

including elevated Reactive Oxygen Species (ROS), lipid peroxidation, DNA strand breaks, or drops in nocturnal melatonin production.

- **Challenges:** It is difficult to isolate RF radiation as the sole trigger for these biological stress markers. Confounding variables, such as poor diet, chemical pollution, sleep deprivation, and psychological stress, trigger the same oxidative pathways, making biochemical causation hard to isolate in a free-living human population.

f. adverse event reporting.

- **Existing Systems:** Federal tracking systems (like the FDA's MedWatch or consumer protection databases) allow citizens and clinicians to report device malfunctions or injuries.
- **Benefits:** Provides a low-cost, decentralized "early warning system" for the public to log unexpected patterns of illness, heating sensations, or hardware defects.
- **Challenges:** These databases rely entirely on self-reporting, leaving them highly vulnerable to selection bias, unverified medical claims, and underreporting by the general medical community, which is largely untrained in recognizing *non-thermal* RF interactions.

g. disease or illness clusters.

- **Existing Systems:** State and local health departments investigate reported local spikes in specific illnesses (i.e., a cancer cluster near a school or workplace).
- **Benefits:** Cluster investigations can rapidly identify severe, localized point-sources of environmental contamination or extreme, non-compliant wireless radiation hotspots.
- **Challenges:** On occasion, reported clusters are ultimately determined to be statistically random anomalies.

h. Other.

To build a truly robust public health framework, future surveillance should leverage two emerging data ecosystems that exist outside traditional clinical boundaries:

Participatory Citizen Science Mapping Networks

- **Mechanism:** Deploying low-cost, standardized, and calibrated crowdsourced RF testers to the public. Volunteers utilize public open-source software and dedicated portable exposimeters to record geographic and temporal radiation baselines in their immediate local environments.

- **Benefits:** Citizen-led mapping projects, such as the global EMF Mapper protocol or the European ETAIN project mobile applications, democratize exposure tracking and create hyper-localized, real-time spatial exposure maps at incredibly high resolutions (i.e., 25-meter grid cells). This massive influx of participatory data captures realistic human exposure dynamics across thousands of microenvironments (homes, commutes, workplaces) .
- **Challenges:** The primary hurdles involve software data interoperability, long-term sensor calibration drift, and the necessity of strict validation protocols to separate rigorous citizen science from low-quality consumer-grade hardware anomalies.

Further, I'm not sure there are any *low-cost* RF exposimeters that test for mmWave frequencies. A device may have to be developed, because if mmWaves aren't included in the testing, people living in dense, urban areas (where ultra-high mmWave frequencies are emitted at high power levels from small cell transmitters) may end up having a false sense of security since midband frequencies from standard macro cell towers may not have a large presence in urban areas anymore due to the expansion of 5G mmWave technology.

Telecom Infrastructure Traffic and Surrogate Network Modeling

- **Mechanism:** Aggregating anonymous, macroscopic telecommunication network data—such as base station downlink power, base station spatial distribution, and localized cellular traffic spikes—and analyzing it via artificial intelligence (AI) and machine learning models.
- **Benefits:** Rather than physically testing every square inch of a city, advanced neural networks can process active network loads to dynamically model cumulative ambient RF-EMF exposure patterns across entire urban populations.
- **Challenges:** Telecommunication providers treat localized traffic data as highly sensitive, proprietary corporate assets. Gaining access to this framework requires strict data-sharing mandates or federal public health legislation. Furthermore, macro-level network traffic models must still be verified by real-world personal dosimetry to ensure statistical accuracy at the ground level.

11. Should exposure assessment or risk evaluation differ for sensitive populations such as those noted below? Please explain.

Yes, exposure assessments and risk evaluations must differ for specific demographics. Standard international exposure guidelines (such as those from ICNIRP) are fundamentally designed around a single archetype: a healthy, adult male, calculating only the thresholds required to prevent acute thermal effects. This framework fails to account for the unique biological vulnerabilities, structural differences, and life-stage factors of sensitive sub-populations.

To establish a scientifically sound framework, regulatory risk evaluations should align with the BioInitiative guidelines for highly sensitive individuals of 0.3 to 0.6 $\mu\text{W}/\text{m}^2$ (see pg. 39). As more research is conducted on 5G signals, it may be determined that this intensity is still too high for certain 5G signals, such as those in the mmWave frequencies.

The specific biological justifications and regulatory requirements for each demographic are detailed below:

a. children.

b. pregnant women.

- **Biological Vulnerability:** Children and developing fetuses represent the highest tier of vulnerability. Structurally, children have thinner cranial bones, smaller head sizes, and tissues with a higher water and salt content than adults. This allows RF radiation to penetrate deeper into their brain tissue and be absorbed at a significantly higher specific absorption rate (SAR).
- **Risk Evaluation Approach:** Risk assessments cannot rely on legacy adult models like SAM (Specific Anthropomorphic Mannequin), a standardized, physical mold used by telecommunications laboratories to test whether cell phones and other wireless devices comply with government radiation safety limits.

They must utilize anatomically accurate, age-scaled computational modeling. Because fetuses and children experience rapid cellular division and ongoing neurological development, safety margins must be set orders of magnitude lower than standard adult limits to protect against long-term, *non-thermal* developmental and genetic alterations.

c. older adults.

f. individuals with preexisting medical conditions.

- **Biological Vulnerability:** Aging and chronic illness inherently degrade the body's natural homeostatic and self-repair mechanisms. Older adults and chronically ill individuals often suffer from diminished cardiovascular efficiency, compromised immune function, and impaired thermoregulation.
- **Risk Evaluation Approach:** Risk evaluations must account for a lowered threshold for systemic stress. When ambient RF/EMF triggers oxidative stress or minor physiological shifts, a healthy adult body can easily compensate. However, in these sensitive populations, the same exposure can exacerbate pre-existing pathologies, demanding much more stringent ambient exposure limits in both residential and healthcare settings.

d. individuals with implanted medical devices.

- **Biological Vulnerability:** This group must be explicitly codified as a "sensitive population," a critical designation because the vulnerability here is both biological and electromechanical.
- **Risk Evaluation Approach:** Beyond direct tissue interactions, risk evaluation must strictly account for Radiofrequency Interference (RFI). Low-level ambient wireless signals can cause pacing errors, signal inhibition, or false telemetry readings in active implants like pacemakers, defibrillators, insulin pumps, and deep-brain stimulators.

Protection standards for public spaces must guarantee that ambient signals remain well below the electromagnetic compatibility (EMC) thresholds of life-sustaining medical hardware.

e. workers with elevated occupational exposure.

- **The Logistical and Regulatory Paradox:** While workers face severe environmental stressors, they occupy a fundamentally different category than the other listed demographics. They are not inherently "sensitive" by biological baseline; rather, their risk is entirely driven by external, elevated cumulative doses.
- **Risk Evaluation Approach:** Occupational settings create an unavoidable logistical problem: many vital industries (such as telecommunications infrastructure, radar operation, and heavy industrial welding) require exposures that necessarily exceed the thresholds scientifically documented to be correlated with *non-thermal* biological effects. If strict *public* safety standards were applied identically to these worksites, the occupations themselves would become legally non-viable.
- **Required Infrastructure:** Regulators must acknowledge this paradox and establish a two-pronged strategy. First, implement robust occupational monitoring, mandatory personal dosimetry, and rotating shift limits.

Second, public health infrastructure must proactively prepare for the reality that these workers may eventually develop chronic, occupationally-induced environmental illnesses like EHS. The CDC needs to codify EHS so it appears in the U.S. Clinical Modification (ICD-10-CM), as explained in question 17 on pg. 101. Currently, society completely lacks specialized medical facilities or dedicated low-radiation sanctuaries. A comprehensive framework must include the development of environmental illness clinics capable of diagnosing and treating EHS.

g. Other populations that may uniquely experience potential adverse health effects in response to RF radiation.

- **Biological Vulnerability:** Individuals with Electromagnetic Hypersensitivity (EHS) must be explicitly designated as a distinct sensitive population, or even more appropriately, categorized under “individuals with preexisting medical conditions” since EHS is clearly a real, verifiable disease/pathology that should also qualify as a “medical condition.”
- **Risk Evaluation Approach:** The same protocols should be followed as for “older adults” and “individuals with preexisting medical conditions,” outlined in (c) and (f) above.

Existing Evidence

12. What scientific evidence exists regarding potential adverse health effects associated with RF radiation exposure at levels below current federal exposure limits?

The most definitive resource to address this inquiry is the comprehensive, color-coded biological effects chart, titled *Reported biological effects from radiofrequency radiation at low-intensity exposure (cell tower, Wi-Fi, wireless laptop and “smart” meter RF intensities)*.⁸⁶ This data repository aggregates numerous peer-reviewed studies documenting systematic biological harm at *non-thermal* radiofrequency radiation (RFR) thresholds thousands of times lower than current FCC public exposure limits.

This chart possesses immense methodological value because it explicitly documents the specific exposure intensities that triggered adverse biological effects in each study.

Unit Standardization and Exposure Threshold Recommendations

While the aforementioned chart primarily utilizes units of microwatts per square centimeter ($\mu\text{W}/\text{cm}^2$), I strongly caution against adopting this metric as a regulatory standard due to its lack of granular resolution for low-intensity tracking. A single unit of $\mu\text{W}/\text{cm}^2$ is equivalent to $10,000 \mu\text{W}/\text{m}^2$, a far greater intensity than any living organism should ever be exposed to.

We must use standardized units of $\mu\text{W}/\text{m}^2$ for further research, as explained on pg. 76, aligning them with the units used by the BioInitiative, Building Biology (SBM) or EUROPAEM frameworks, discussed on pg. 39.

⁸⁶ bioinitiative.org. (2014). *Reported biological effects from radiofrequency radiation at low-intensity exposure (cell tower, Wi-Fi, wireless laptop and “smart” meter RF intensities)*. <https://bioinitiative.org/wp-content/uploads/pdfs/BioInitiativeReport-RF-Color-Charts.pdf>

Biological Effects Occur at Super-Low Intensity RF

An examination of the upper tiers of the data chart demonstrates that profound cellular and genetic disruptions manifest at extraordinarily faint, *non-thermal* intensities. The top three low-intensity studies are analyzed below.

To demonstrate the critical need for a more granular standard, I converted the scientific notation in the second column to $\mu\text{W}/\text{m}^2$. This conversion clearly illustrates that the thresholds at which these severe biological effects were observed are a mere 0.001, 0.01, and 1 $\mu\text{W}/\text{m}^2$.

These observed effects at precisely-measured extremely low intensities demonstrate that biological systems are highly sensitive to electromagnetic signaling at fractions of a percent of current thermal safety standards. This research was from the 1990's, so it's not new.

Exposure Intensity	Scientific Power Notation ($\mu\text{W}/\text{m}^2$)	Documented Biological Effects	Study Citation
100 femtowatts/ cm^2	$10^{-3} \mu\text{W}/\text{m}^2$ (or 0.001 $\mu\text{W}/\text{m}^2$)	Super-low intensity RFR at microwave resonant frequencies resulted in changes in genes and structural problems with chromatin conformation (DNA).	Belyaev, 1997
5 picowatts/ cm^2	$10^{-2} \mu\text{W}/\text{m}^2$ (or 0.01 $\mu\text{W}/\text{m}^2$)	Exposure directly altered and disrupted growth rates in cellular yeast models.	Grundler, 1992
0.1 nanowatt/ cm^2 (or 100 picowatts/ cm^2)	$10^0 \mu\text{W}/\text{m}^2$ (or 1 $\mu\text{W}/\text{m}^2$)	Intensities directly comparable to cell phone base stations resulted in altered gene expression and problems with chromatin condensation.	Belyaev, 1997

13. According to scientific evidence, how do the technologies below affect cumulative exposure patterns?

a. 5G.

The deployment of fifth-generation (5G) mmWave wireless technology fundamentally alters human cumulative exposure patterns, shifting the environmental baseline from a generalized, uniform field into a highly complex, multi-frequency matrix characterized by intense, localized, and transient peak power bursts. 5G architecture changes public exposure mechanics through three distinct technological vectors: dynamic beamforming, small-cell infrastructure densification, and complex pulse-modulated signal architectures.

- Dynamic Beamforming and Spatial Masking:

Unlike legacy networks that broadcast radiofrequency (RF) radiation in wide, static arcs, 5G mmWave technology utilizes active antenna systems to concentrate electromagnetic energy into narrow, highly-focused steerable beams directed precisely at the antennas of active devices.

This introduces sharp, high-intensity spatial microbursts into the environment. Current federal compliance protocols smooth/flatten/average this volatile data by averaging exposure over arbitrary 6- to 30-minute windows. This time-averaging methodology acts as a mathematical mask, completely hiding the highly bioactive peak power densities. An example of how this works with smart meter RF emissions is on pg. 49. The practice of smoothing/flattening/averaging must be abolished (see pg. 42).

- Small Cell Densification and Involuntary Proximity:

Because the higher frequencies utilized by 5G, particularly millimeter-wave (mmWave) frequencies, possess poor structural penetration capabilities and attenuate rapidly in space, telecommunications providers deploy a *dense grid* of localized "small cell" transmitters.

Placed on neighborhood utility poles, streetlights, and traffic intersections, these antennas place active transmitters in immediate, close-range proximity to homes, schools, and public spaces. This structural rollout effectively eliminates the natural safety barrier of distance, trapping citizens inside an inescapable, overlapping grid of continuous multi-directional radiation.

- Complex Pulse-modulated Signal Architectures:

5G relies on Orthogonal Frequency-Division Multiplexing (OFDM) to pack massive amounts of data into heavily pulsed, polarized, and rapidly fluctuating signal packets. Independent molecular research establishes that these complex, fast-moving wave modulations are significantly more biologically active than older, simpler transmission protocols.

As explained previously with supporting evidence on pg. 72, the rapid, irregular pulsing forces destructive oscillations within voltage-gated ion channels (VGICs), triggering *non-thermal* cellular oxidative stress and cellular degradation far below current thermal safety limits.

b. 6G.

Due to the highly specialized nature of this sub-question and the fixed regulatory timeframe for submissions, I am deferring a formal response to ensure the absolute accuracy and integrity of my commentary.

c. Wi-Fi.

Wireless Local Area Networks (WLAN), operating under the commercial term Wi-Fi, represent the single largest source of continuous, close-range indoor RF/EMF exposure for the general population. Independent field dosimetry and biophysical research demonstrate that modern Wi-Fi infrastructure has shifted the indoor environmental baseline from situational network access into a permanent state of chronic inundation through three distinct technological shifts: tri-band spectral saturation, the explosion of the Internet of Things (IoT) device density, and high-density pulse-modulated data compression.

1. Tri-Band Spectral Saturation and Multi-Layered Environments:

While legacy Wi-Fi infrastructure operated exclusively within the 2.45 GHz microwave band (the identical frequency baseline utilized by microwave ovens to vibrate water molecules, as explained on pg. 58), modern Wi-Fi 6E and Wi-Fi 7 standards introduce simultaneous tri-band broadcasting across the 2.4 GHz, 5 GHz, and 6 GHz spectrums.

Users of newer routers are no longer exposed to a singular, isolated frequency, but are immersed in a multi-layered electromagnetic matrix. Furthermore, these shorter 5–6 GHz wavelengths reflect off interior walls and metallic framing, creating complex indoor standing wave gradients and unpredictable localized intensity hot spots within active living and sleeping areas.

- The Internet of Things (IoT) and Inescapable Device Density:

The rapid expansion of "smart-home" ecosystems has exponentially multiplied the number of active transmitters inside the home. A single residential router now maintains constant, simultaneous communication loops with dozens of active devices, including smart appliances, utility interfaces, wireless security cameras, and voice assistants.

This hyper-densification completely eliminates historical network idle periods---modern IoT hardware executes continuous, background network pings and beacon pulses 24 hours a day, 7 days a week, ensuring that the indoor environment is never clear of artificial radiation.

- Non-Thermal Bioactivity:

Biophysical research establishes that human cell membranes do not experience these signals as a gentle background field. As previously explained and evidenced on pg. 72, highly complex, fast-moving wave modulations force irregular, unnatural oscillations within voltage-gated ion channels (VGICs), disrupting cellular metabolism, triggering a cascade of reactive oxygen species (ROS), and driving *non-thermal* oxidative stress far below current federal thermal limits.

Consequently, modern Wi-Fi technology establishes an inescapable, multi-frequency indoor matrix, rendering legacy thermal safety standards entirely obsolete. It needs to be regulated. I proposed suggestions for improvements in the design of routers on pg. 53. I also proposed mandates that hospitals and schools be prohibited from deploying Wi-Fi networks, as explained on pg. 45.

d. Satellite-based communications.

Satellite-based communications and the rapid deployment of low-Earth orbit (LEO) mega-constellations fundamentally redefine cumulative exposure patterns by introducing a permanent, inescapable global blanket of ambient RF/EMF. This technological expansion effectively eliminates the possibility of finding true outdoor sanctuaries or pristine electromagnetic baselines on Earth.

- The Erasure of Geographic Sanctuaries:

Unlike terrestrial macro cell towers, which are restricted by geography, terrain shielding, and municipal boundaries, satellite arrays project a continuous downward matrix of high-frequency RF/EMF across every square inch of the planet's surface.

Because these space-borne networks operate via massive overlapping satellite beams to provide seamless global data coverage, they bypass traditional natural barriers like mountains or remote forests. Consequently, individuals suffering from Electromagnetic Hypersensitivity (EHS) are stripped of their ability to seek refuge in wilderness areas or unindustrialized zones, as the upper atmosphere is systematically transformed into a permanent transmission grid.

- The Elimination of Nature-Based Convalescence:

To bar sensitive individuals from safely interacting with the natural world without aggravating severe physiological symptoms is an egregious regulatory and ethical failure. Extensive, peer-reviewed clinical research has repeatedly demonstrated that immersive exposure to natural environments—frequently evaluated under frameworks of "green space exposure" or ecotherapy—exerts measurable beneficial health effects, including down-regulating systemic cortisol production⁸⁷, stabilizing autonomic nervous system function⁸⁸, and mitigating chronic neuro-inflammation.⁸⁹

⁸⁷ Bryer, B., Odebeatu, C. C., Lee, W. R., Vitangcol, K., Gallegos-Rejas, V., Osborne, N. J., Williams, G., & Darssan, D. (2025). Greenspace exposure and associated health outcomes: A systematic review of reviews. *F1000Research*, 13, 491. <https://doi.org/10.12688/f1000research.148878.2>

⁸⁸ Jo, H., Song, C., & Miyazaki, Y. (2019). Physiological benefits of viewing nature: A systematic review of indoor experiments. *International Journal of Environmental Research and Public Health*, 16(23), 4739. <https://doi.org/10.3390/ijerph16234739>

Forcing an inescapable baseline of artificial radiation into these historically therapeutic spaces inflicts a severe public health penalty on highly sensitive populations who rely on natural environments for physiological stabilization.

- Downlink Densification and Spectral Bioactivity: Modern LEO satellite arrays rely heavily on highly focused Ku-band, Ka-band, and emerging V-band frequencies (ranging from 12 GHz to over 75 GHz), utilizing advanced phased-array beamforming to establish connections with ground terminals.

Biophysical literature confirms that these high-frequency, heavily modulated, and polarized satellite downlinks do not manifest as a gentle background field. Instead, their rapid packet-pulsing protocols interact dynamically with biological membranes, inducing cellular oxidative stress and forcing destructive oscillations within voltage-gated ion channels (VGICs) far below established thermal guidelines (see pg. 61).

By allowing private aerospace entities to saturate the global biosphere with space-borne downlinks, regulatory bodies are permitting the permanent contamination of the global commons, forcing an inescapable and highly bioactive cumulative RF/EMF exposure onto vulnerable populations.⁹⁰

e. Internet of Things (IoT); and

g. Smart homes/appliances.

The market for smart home technology has expanded exponentially, transitioning from simple remote-controlled gadgets into a dense, interconnected ecosystem of appliances and infrastructure referred to as IoT (Internet of Things) smart devices. These devices rely on built-in wireless transceivers—predominantly utilizing Wi-Fi, Bluetooth, Zigbee, or Z-Wave protocols—to maintain continuous communication loops with residential routers and smartphone applications.

One's home now has the potential to be inundated with a wide range of IoT (Internet of Things) smart devices in several categories such as Home Appliances (i.e. Dishwasher, Refrigerator, Range, Washer, Dryer), Climate Control and Environmental Monitoring (i.e. Smart thermostats, vents, blinds, environmental sensors); Power Management, Lighting and Infrastructure (i.e. Smart outlets and plugs, light switches and dimmers, power strips, LED bulbs); and Security and Access Control (i.e. Smart deadbolts and locks, security cameras and video doorbells, window and door sensors), and too many electronic devices to name.

⁸⁹ Stanhope, J., Breed, M. F., & Weinstein, P. (2020). Exposure to greenspaces could reduce the high global burden of pain. *Environmental Research*, 187, 109641. <https://doi.org/10.1016/j.envres.2020.109641>

⁹⁰ Boley, A. C., & Byers, M. (2021). Satellite mega-constellations create risks in low earth orbit, the atmosphere and on earth. *Scientific Reports*, 11(1). <https://doi.org/10.1038/s41598-021-89909-7>

“Smart” homes are not a smart idea: A “smart” home creates an inescapable indoor environment that essentially resembles living inside a low-power microwave oven.

The biggest issue is the default-ON manufacturing baseline: Even when idle, such as a smart washing machine sitting completely unused in an empty room, the embedded wireless chips are engineered to *continuously* broadcast high-intensity RF. This is verified by investigative data from the “Tech Wellness • SaferTech” research channel (2022), which documented a standard smart washing machine emitting an astonishing 137,000 $\mu\text{W}/\text{m}^2$ of wireless energy *while completely idle*.⁹¹

It must become legally mandatory for manufacturers to include a *physical*, hardware-based on/off switch for all appliances with RF-transmitting components possessing essential functions that do not require wireless signaling. Currently, consumers are forced to physically dismantle appliances to manually extract wireless cards, many of which are permanently soldered to the motherboard.

f. Wearable technologies.

Wearable technologies compress the physical distance between the transmitter and human tissue to zero, subjecting sensitive biological systems to uninterrupted, localized, near-field radiation patches. Because these consumer tracking devices are seamlessly integrated into daily habits, they are typically worn throughout all waking hours, and many users do not even remove them while sleeping. This results in uninterrupted, near-field exposure 24 hours a day.

- The Deceptive Nature of Low-Power Metrics:

Radiation risks of wearable technology are frequently dismissed by arguments that Bluetooth and localized Wi-Fi chips operate at lower transmission powers than standard smartphones. However, this argument ignores basic physics. Because field strength drops off exponentially with distance, a high-powered device kept several feet away can actually deliver a lower localized RF dose than a low-power transmitter held flush against the skin.

By placing active transceivers in direct, extreme contact with the body, wearables achieve a highly elevated localized Specific Absorption Rate (SAR) and power density directly within the skin-surface layer, the underlying musculature, and superficial blood vessels.⁹²

⁹¹ Tech Wellness • SaferTech. (2022, June 2). *DIY disconnect WIFI from smart appliances LG Washer/Dryer for EMF protection now*. August Brice [Video]. YouTube. <https://www.youtube.com/watch?v=0mKT3H1MFRM>

⁹² Kim, S., Yakub Ahmed, S., & Imtiaz, N. (2024). Human electromagnetic field exposure in wearable communications systems: A review. *E-Prime - Advances in Electrical Engineering, Electronics and Energy*, 8, 100508. <https://doi.org/10.1016/j.prime.2024.100508>

- The Temporal Trap of Continuous Exposure:

The factor of continuous duration fundamentally shifts the human exposure profile from intermittent to chronic. While a smartphone is typically set down or stored in a bag for portions of the day, a smartwatch or fitness tracker maintains a permanent physical contact with the user's skin. This 24/7 exposure timeline means that local cells never receive a period of biological rest or environmental remediation.

When worn overnight to track biometrics, the continuous pulsed RF pings occur during critical cellular repair windows, introducing an artificial stressor during the exact time the body is engineered and prepared to undergo physiological recovery—during sleep.

- Near-Field Bioactivity and Oxidative Stress:

Modern wearable hardware relies on heavily pulsed, polarized, and coherent microbursts of data to sync biometric tracking logs with smartphone software. Peer-reviewed molecular research establishes that these continuous, close-range wave modulations target the plasma membrane of adjacent cells. This localized near-field radiation forces irregular physical oscillations within voltage-gated ion channels (VGICs), breaking down delicate intracellular electrochemical gradients and triggering a rapid overproduction of reactive oxygen species (ROS). Refer to pg. 61.

By allowing these devices to be marketed without strict near-field *non-thermal* safety warnings, regulatory frameworks are permitting consumers to unknowingly attach active, continuous radiation patches directly to their bodies, systematically eroding their physiological resilience far below legacy tissue-heating thresholds.

h. Smart cities.

Smart city initiatives saturate entire municipal zones with dense networks of environmental sensors and communication relays.

All smart city projects should be immediately halted pending comprehensive environmental and public health reviews, and most importantly, until updated biologically-based RF exposure standards are finalized.

Municipalities are currently dictating these master plans without public comment or voter consent. These invasive technological expansions must be subjected to direct democratic voting by local residents before any local deployment can legally proceed.

i. Autonomous vehicles.

Autonomous and semi-autonomous vehicles generate severe, localized electromagnetic fields due to the high-density array of continuous radar, LiDAR⁹³, and wireless sensors built into the vehicle body.

Furthermore, many automotive LiDAR systems utilize near-infrared lasers operating within the "retinal hazard window" (400 nm to 1400 nm, most commonly at 905 nm). Light within this spectrum passes directly through the eye's natural lens, which acts as a magnifying glass that focuses the beam into a hyper-concentrated spot on the back of the eye. This creates an intense energy density capable of triggering rapid thermal photocoagulation, literally cooking the proteins within the Retinal Pigment Epithelium (RPE), and irreversibly destroying photoreceptor cells (rods and cones).

High-resolution imaging consistently reveals that these laser exposures disrupt the foveal ellipsoid zone, leading to immediate cellular death, permanent blind spots, and secondary inflammatory tissue damage.

By flooding public roads with unmonitored, high-intensity optical radiation hazards, these vehicle arrays make the public environment physically unsafe for vehicle occupants, surrounding commuters, and anyone positioned along the roadway within the beams' sight lines.

j. Wireless medical devices.

The ubiquitous integration of wireless components into critical healthcare hardware represents a profound design and regulatory failure. Following the rollout of Bluetooth Low Energy (BLE) in 2010 and the finalization of the FDA's regulatory framework for wireless medical devices in 2013, manufacturers have established wireless transmission as a near-mandatory commercial engineering standard.

In my experience earlier this year shopping for a consumer EKG monitor to record heart rates and rhythms, I discovered it may now truly be impossible to locate a brand-new model that will operate *without* wireless signals being transmitted. Prior to purchasing a specific monitor, I formally inquired with the manufacturer about deactivating its wireless components and was explicitly assured that the Bluetooth transmitter would remain completely inactive so long as the monitor was not actively synced to an external device.

However, upon testing the monitor with my calibrated RF meter, I verified constant, signaling the moment the device was powered on. When I contacted customer support to resolve this discrepancy, I was informed that the transceiver could not be disabled and that no administrative menus or hidden keystroke sequences existed to terminate

⁹³ LiDAR stands for Light Detection and Ranging. It is a remote sensing technology that uses pulses of laser light to measure distances and create highly detailed, 3D digital maps of the surrounding environment.

the signal. Ultimately, I was forced to return the device, and have been unable to obtain an alternate device I can use. This outcome was profoundly disappointing, as this model was the only one I had located that featured an independent physical display capable of providing clinical readings without requiring a continuous wireless pairing with a smartphone.

This forced, always-on wireless integration results in three distinct public health crises:

- RF Emissions Can Affect Health Data:

The presence of localized RF/EMF emissions, particularly in a device designed to measure heart rates and rhythms, defeats the clinical purpose of the diagnostic device itself by inducing biological stress, heart rate variability anomalies, and neurological distress in the patient being monitored (refer to pg. 69).

- Unnecessary Exposures:

Many health monitoring devices are generally fully capable of functioning independently, or at least performing their essential, life-saving features, or even data-logging, without an active wireless link. These always-active RF/EMF emissions serve absolutely no purpose if the user does not intend to sync the monitor to a smartphone/tablet.

- Elimination of Patient Autonomy:

The always-on standard for wireless modules eliminates the ability for individuals with electromagnetic sensitivities to engage in home health monitoring—such as tracking their own blood pressure or heart rhythms—completely stripping away the baseline medical autonomy that used to exist in the not-so-distant past.

k. Communication enabled smart meters.

My comments in regard to the public's exposure to smart meters is integrated with the "Regulation of Automated Metering Infrastructure (Smart Utility Meters)" section of Question 5n on pg. 47.

14. What scientific evidence exists regarding potential adverse environmental effects associated with RF radiation?

The Environmental Health Trust (EHT) maintains a separate website from their main one⁹⁴, with the current heading, *Wildlife, Wireless & The Environment - A Call For Protection*. It can be accessed at <https://www.wildlifeandwireless.org/>. A large

⁹⁴ <https://ehtrust.org/>

repository of scientific articles have been curated for examination, organized within the following categories: Birds, Bees & Pollinators, Trees & Plants. To make the research accessible, every complex study is paired with a clear, plain-language summary tailored for the general public. Links to the official scientific studies are provided within.

This ecosystem-level threat is clearly defined in a three-part review by B. Blake Levitt, Henry C. Lai, and Albert M. Manville, which establishes that extremely low intensity electromagnetic fields are actively disrupting the global biome. In *Effects of non-ionizing electromagnetic fields on flora and fauna, part 1. rising ambient EMF levels in the environment*, the authors document a staggering 70-fold exponential increase in ambient radiofrequency radiation (RFR) since the late 1970s, warning that complex 5G phased-array architectures and satellite downlinks generate bioactive pulse-modulated waveforms that completely outpace evolutionary adaptive mechanisms.⁹⁵

In their consecutive review, *Effects of non-ionizing electromagnetic fields on flora and fauna, part 2 impacts: how species interact with natural and man-made EMF*, the authors delineate the explicit molecular and behavioral mechanisms of harm, demonstrating how man-made fields scramble the delicate magnetoreception equipment (such as cryptochromes and biogenic magnetite) that animals rely on for orientation, natal homing, and survival. This review aggregates definitive evidence of cyto- and genotoxic disruptions across all biological taxa, including mammals, birds, amphibians, and soil microbes, proving that chronic, low-level electromagnetic radiation erodes ecological integrity.⁹⁶

The report titled *Biological effects of electric, magnetic, and electromagnetic fields from 0 to 100 MHz on fauna and flora: workshop report* evaluates the lower-frequency bands, detailing how weak electric and magnetic fields interface with the complex endogenous electrical current structures of plants and animals. The report synthesizes current scientific observations regarding oxidative stress induction, altered metabolic pathways, and behavioral alignment shifts in wildlife exposed to power-frequency grids, stray current, and low-frequency transients, confirming that biological sensitivity to artificial fields extends across the entire non-ionizing spectrum.⁹⁷

The catastrophic real-world consequences on vegetation are extensively verified by Cornelia Waldmann-Selsam and colleagues through rigorous, long-term botanical documentation in Germany. Her 10-year observational study, *Trees in Bamberg and*

⁹⁵ Levitt, B. B., Lai, H. C., & Manville, A. M. (2021). Effects of non-ionizing electromagnetic fields on flora and fauna, part 1. rising ambient EMF levels in the environment. *Reviews on Environmental Health*, 37(1), 81–122. <https://doi.org/10.1515/reveh-2021-0026>

⁹⁶ Levitt, B. B., Lai, H. C., & Manville, A. M. (2021b). Effects of non-ionizing electromagnetic fields on flora and fauna, part 2 impacts: How species interact with natural and man-made EMF. *Reviews on Environmental Health*, 37(3), 327–406. <https://doi.org/10.1515/reveh-2021-0050>

⁹⁷ Pophof, B., Henschenmacher, B., Kattnig, D. R., Kuhne, J., Vian, A., & Ziegelberger, G. (2022). Biological effects of electric, magnetic, and electromagnetic fields from 0 to 100 MHz on fauna and flora: Workshop report. *Health Physics*, 124(1), 39–52. <https://doi.org/10.1097/hp.0000000000001624>

Hallstadt in the radiation field of 65 mobile phone base stations: Examples from a documentation about 700 trees (2006–2016), provides an exhaustive photographic and technical index of 700 urban trees, demonstrating a repeated pattern of severe, unilateral crown transparency, needle loss, and leaf browning that manifests exclusively on the side of the tree maintaining direct line-of-sight exposure to a cellular base station.⁹⁸

The study, *Radiofrequency radiation injures trees around mobile phone base stations*, pairs the decade of documentation with precise field dosimetry. By measuring a stark difference in power flux density between the exposed and shielded sides of individual trees (such as 970 $\mu\text{W}/\text{m}^2$ vs. 130 $\mu\text{W}/\text{m}^2$), the researchers proved that leaves and needles absorb and scatter RFR, causing the tree to act as a physical shield that protects its opposite side. This asymmetric exposure causes localized cellular tissue death that systematically spreads to the rest of the tree over time, demonstrating that current legal limits fail to protect vital forest flora from continuous environmental electrosmog.⁹⁹

The article *Exposure of Insects to Radio-Frequency Electromagnetic Fields from 2 to 120 GHz* by Thielens et al. (2018) demonstrates that rising wireless frequencies in the millimeter-wave spectrum (5G mmWave technology), match the physical dimensions of various insects, triggering a severe resonance effect. In other words, a standing mmWave can resonate within the insect simply because the insect is approximately the same length as the wavelength of the mmWave. This size alignment leads to a significant increase in radiofrequency absorption, which may induce metabolic heating and behavioral disruptions in vital pollinators.¹⁰⁰

15. What types of scientific evidence should be considered when evaluating RF exposure associated with wireless infrastructure? Please comment on:

a. proximity to homes, schools, childcare facilities, healthcare facilities, and/or workplaces.

Risk evaluations must prioritize near-field modeling (measuring radiation levels extremely close to the source where the energy is strongest) and calculate the intersection of main-beam antenna lobes with human structural boundaries (exactly where the most concentrated beam of energy coming out of the antenna hits the walls or windows of a building).

⁹⁸ Waldmann-Selsam, C. (2016). *Trees in Bamberg and Hallstadt in the radiation field of 65 mobile phone base stations: Examples from a documentation about 700 trees (2006–2016)*. <https://www.padrak.com/vesperman/Trees-in-Bamberg-and-Hallstadt-Documentation-2006-2016.pdf>

⁹⁹ Waldmann-Selsam, C., Balmori-de la Puente, A., Breunig, H., & Balmori, A. (2016). Radiofrequency radiation injures trees around mobile phone base stations. *Science of The Total Environment*, 572, 554–569. <https://doi.org/10.1016/j.scitotenv.2016.08.045>

¹⁰⁰ Thielens, A., Bell, D., Mortimore, D. B., Greco, M. K., Martens, L., & Joseph, W. (2018). Exposure of insects to radio-frequency electromagnetic fields from 2 to 120 GHz. *Scientific Reports*, 8(1), 1–10. <https://doi.org/10.1038/s41598-018-22271-3>

Because children, pregnant women, and medical patients possess elevated biological vulnerability, proximity studies must evaluate *non-thermal* effects, such as those discussed in Question 6 and 12 on pages 57 and 86, respectively.

Assessments cannot assume that a uniform distance provides safety. They must factor in structural building materials (which alter signal reflection and internal resonance), and use dosimeters to calculate actual RF/EMF exposure levels within the actual indoor spaces where sensitive populations receive hours of continuous cumulative exposure.

b. cumulative neighborhood exposure.

Regulatory bodies need to evaluate the additive and synergistic effects of multi-source radiation fields. Current guidelines erroneously evaluate single transmitters in absolute isolation. In dense residential areas, ambient fields are dictated by the overlapping signals of multiple cellular carriers, macro towers, private Wi-Fi routers, smart grid utilities, and mesh network smart metering infrastructure.

Evidentiary reviews must incorporate continuous, wideband spectrum analysis to capture the total integrated power density of a neighborhood.

Risk models must be based on a strict cumulative exposure cap (preferably aligned with the BioInitiative guidelines of 3 to 6 $\mu\text{W}/\text{m}^2$ (see pg. 39)), ensuring that the addition of any new antenna array cannot push the baseline environment past a biologically safe, non-thermal threshold for RF/EMF exposure.¹⁰¹

c. antenna density.

See Regulatory Reforms section of Question 5n, Reform 3A on pg. 43.

d. small-cell deployment.

The deployment of 5G and emerging small-cell infrastructure introduces high-frequency millimeter waves (mmWaves) directly into micro-environments. Because these transmitters are mounted on utility poles and lampposts mere feet from residential windows, they eliminate the protective buffer of physical distance. Scientific evaluation must address the unique biophysical interactions of high-frequency waves with human tissue.

This includes peer-reviewed modeling demonstrating that shorter mmWave wavelengths perfectly match the helical dimensions of human sweat ducts. Under these frequencies, sweat ducts cease to act as simple passive barriers and instead

¹⁰¹ It may eventually be necessary to lower the BioInitiative guidelines even further when setting limits for 5G signals. This is because both millimeter waves (mmWaves) and complex signal architectures have been correlated with greater biological harm at much lower intensities than older wireless technologies.

function as microscopic helical antennas, drawing electromagnetic energy directly into the upper dermal layers and generating intense, localized cellular stress (refer to pg. 73).

Risk assessments must evaluate these concentrated, near-field micro-exposures rather than averaging radiation densities over a large geographic area.

e. livestock.

Evaluating infrastructure impact requires expanding risk assessments to veterinary and agricultural data. Livestock, particularly dairy cattle, serve as critical environmental indicators due to their continuous, unshielded contact with the ground and physical farm infrastructure.

Robust epidemiological and field data—most notably led by Dr. Magda Havas alongside researchers like Dr. Don Hillman—establish a clear causal link between electromagnetic pollution, ground current (stray voltage), and severe biological degradation in livestock.¹⁰²

When high-frequency wireless signals from nearby cell towers couple with local utility distribution lines, they generate high-frequency voltage transients (dirty electricity) that dump return currents directly into the earth. Dr. Havas's research documents that livestock exposed to these ground currents experience profound systemic stress.¹⁰³

Dairy cows subjected to this ambient and structural electrical stress exhibit extreme nervousness, swollen hocks, and open sores that refuse to heal due to suppressed immune and self-repair mechanisms. Behaviorally, cows display an acute reluctance to enter milking parlors or approach metallic water bowls and feeders where conductive electron flow shocks their sensitive tissues. Financially and biologically, this chronic stress directly disrupts endocrine function, causing catastrophic drops in milk yield, altered milk fat and quality, and severe reproductive failure across herds.

Environmental impact reports for wireless infrastructure must evaluate regional grid quality and agricultural soil conductivity within a multi-mile radius of any proposed tower. Infrastructure must be restricted near livestock zones to prevent wireless signaling from inducing destructive ground current anomalies that compromise veterinary health and food security.

¹⁰² Hillman, D., Stetzer, D., Graham, M., Goeke, C. L., Mathson, K. E., Vanhorn, H. H., & Wilcox, C. J. (2013). Relationship of electric power quality to milk production of dairy herds - field study with literature review. *The Science of the Total Environment*, 447, 500–514. PubMed. <https://doi.org/10.1016/j.scitotenv.2012.12.089>

¹⁰³ Stetzer, D., Leavitt, A. M., Goeke, C. L., & Havas, M. (2016). Monitoring and remediation of on-farm and off-farm ground current measured as step potential on a Wisconsin dairy farm: A case study. *Electromagnetic Biology and Medicine*, 35(4), 321–336. PubMed. <https://doi.org/10.3109/15368378.2015.1089888>

Federal Research Priorities

16. What are the highest priority research gaps regarding EMF and RF radiation and public health that the federal health agencies should address?

5G

Exhaustive, independent biological testing must be conducted on 5G millimeter waves to determine biologically-based exposure limits before the commercial rollout of next-generation 6G Terahertz (THz) frequencies is permitted to proceed.

Future research grants must specifically target how complex artificial modulation protocols—such as Orthogonal Frequency-Division Multiplexing (OFDM) and localized packet bursts—interact with human cell membranes and biological structures. Ample evidence already indicates that heavily modulated and pulsed frequencies are drastically more bioactive than continuous transmissions, yet current safety guidelines completely ignore these signal architecture differences.

The only published peer-reviewed human 5G study of which I am aware is the 2025 case study, “*Summary of seven Swedish case reports on the microwave syndrome associated with 5G radiofrequency radiation*” (see pg. 72). This study demonstrates an *extremely urgent* need to study 5G health effects, considering that the onset of Microwave Syndrome (another name for EHS) occurred immediately in these seven individuals after 5G antennas were installed near their residences. It was further demonstrated that their symptoms dissipated when they moved away from the 5G antennas.

Electromagnetic Hypersensitivity (EHS)

Preventing further individuals from acquiring EHS is imperative, as is determining treatments that work to restore the health of an individual with EHS. Federal agencies must adopt currently known, reliable, quantifiable biomarkers to track health effects from exposure to RF/EMF (as well as fund research to discover other useful biomarkers), so that clear evidence of the progression or regression of the disease can be obtained.

In the comprehensive international analysis titled *The Critical Importance of Molecular Biomarkers and Imaging in the Study of Electrohypersensitivity. A Scientific Consensus International Report*, a global consortium of independent scientists verified that EHS individuals express distinct, measurable blood and urinary biomarkers.¹⁰⁴

¹⁰⁴ Belpomme, D., Carlo, G. L., Irigaray, P., Carpenter, D. O., Hardell, L., Kundi, M., Belyaev, I., Havas, M., Adlkofer, F., Heuser, G., Miller, A. B., Caccamo, D., De Luca, C., von Klitzing, L., Pall, M. L., Bandara, P., Stein, Y., Sage, C., Soffritti, M., ... Vorst, A. V. (2021). The Critical Importance of Molecular Biomarkers and Imaging in the Study of Electrohypersensitivity. A Scientific Consensus International Report. *International Journal of Molecular Sciences*, 22(14), 7321. <https://doi.org/10.3390/ijms22147321>

The best resource for constructing a viable framework of useful biomarkers to make an objective diagnosis is written by Dr. Belpomme and his research partner, Dr. Philippe Irigaray, and can be found on pgs. 313-322 of Chapter 8: "Electro-hypersensitivity as a Worldwide, Man-made Electromagnetic Pathology: A Review of the Medical Evidence" contained within Dr. Panagopoulos's 2023 authoritative textbook, *Electromagnetic Fields of Wireless Communications: Biological and Health Effects* (see footnote 30).

17. How can federal health agencies improve coordination of EMF and RF radiation research? Please comment on potential roles for federal health agencies including, but not limited to:

a. HHS Food and Drug Administration (FDA).

b. HHS National Institutes of Health (NIH).

c. HHS Centers for Disease Control and Prevention (CDC).

I lack sufficient familiarity with these agencies' current responsibilities to evaluate or suggest improvements to their coordination.

However, it is my understanding that the CDC is the agency responsible for officially recognizing, defining, and codifying (assigning a code) newly identified diseases so that they can appear in the U.S. Clinical Modification (ICD-10-CM). I propose the official recognition of EHS, as explained below.

A newly identified disease exists requiring official recognition by the CDC: Electromagnetic Hypersensitivity (EHS).

It should be understood that EHS has unfortunately been characterized under *numerous* different names, causing confusion and complexity.¹⁰⁵ It is evident the name of this disease needs to be unified.

While a prominent organization known as the One Name Project advocates for unifying the terminology under the name Electromagnetic Radiation Syndrome (EMR Syndrome)¹⁰⁶, my comment utilizes the term Electromagnetic Hypersensitivity (EHS) throughout. This designation aligns with the vast majority of peer-reviewed scientific literature encountered in my research, matches the terminology established by Dr. Belpomme and Dr. Irigaray, and reflects the nomenclature with which I am most familiar.

¹⁰⁵ Some of these different names for the same disease are: Microwave Syndrome, Sickness or Illness; Radiofrequency Sickness Syndrome; Radiation Sickness; Wi-fi sickness or Wi-fi allergy; Idiopathic Environmental Intolerance attributed to electromagnetic fields (IEI-EMF); Rapid Aging Syndrome (Dr. Magda Havas's term); and Electromagnetic Illness (EMI)

¹⁰⁶ Launched in January 2024, the OneName Project was spearheaded by a team of disability advocates, scientists, and medical professionals. Its goal was to address the confusion caused by fragmented names like Electrohypersensitivity (EHS), Microwave Syndrome, Radiation Sickness, and Electromagnetic Sensitivity. On January 28, 2025, the initiative officially announced that they are uniting under the single name EMR Syndrome (short for Electromagnetic Radiation Syndrome). <https://groups.io/g/OneName>

This newly defined¹⁰⁷ pathological disorder, EHS, is explained in precise detail in the 2020 clinical milestone paper by Dr. Belpomme and Dr. Irigaray, titled *Electrohypersensitivity as a Newly Identified and Characterized Neurologic Pathological Disorder: How to Diagnose, Treat, and Prevent It*.¹⁰⁸

Dr. Belpomme and Dr. Irigaray have since authored Chapter 8: "Electro-hypersensitivity as a Worldwide, Man-made Electromagnetic Pathology: A Review of the Medical Evidence" contained within Dr. Panagopoulos's 2023 authoritative textbook, *Electromagnetic Fields of Wireless Communications: Biological and Health Effects* (see footnote 30). Their work represents the most comprehensive examination and review to date of peer-reviewed scientific research relating to EHS. This extensive documentation, which contains nearly 20 pages of citations of peer-reviewed scientific articles, should be more than adequate to initiate the administrative process for the CDC to classify EHS as a new disease.

On pg. 299 of Dr. Panagopoulos's textbook, at the end of the Abstract of Chapter 8 by Dr. Belpomme and Dr. Irigaray, it is written, "*Taken into consideration the WHO-proposed causality criteria, we argue that EHS may, in fact, be causally related to increased exposure to manmade electromagnetic fields (EMFs)...We, therefore, appeal to all governments and international health institutions and, more particularly, the WHO to urgently consider this growing EHS-associated pandemic plague and to acknowledge EHS as a new real disorder.*"

Although the CDC has separated its operational ties with the WHO, the U.S. Clinical Modification (ICD-10-CM) remains structurally bound to the WHO's core ICD-10 framework. While the final authority to include a new disease code rests entirely with the domestic ICD-10 Coordination and Maintenance Committee, Dr. Belpomme's and Dr. Irigaray's alignment with WHO-proposed causality criteria in their Chapter 8 review of the current scientific literature pertaining to EHS, provides the precise type of

¹⁰⁷ Newly defined does not mean the disease itself is "new." It most definitely is not new. EHS was described decades ago in U.S. military and Russian scientific research, though it was commonly referred to as "Microwave Sickness" or "Microwave Illness" back then.

The most famous longtime sufferer is a Swedish man, Per Segerbäck, dubbed "*The Man Who Was Allergic To Radio Waves*," by Popular Science magazine in a 2010 article that is unfortunately no longer available online. He was an elite telecommunications engineer who worked for over 20 years at Ellemtel, a division of Ericsson, designing advanced integrated circuits in a dense electromagnetic environment. After developing severe electromagnetic hypersensitivity in the late 1980s that ultimately forced him into total exile in an isolated nature reserve cottage, he has never recovered and remains unable to tolerate ambient electronic hardware or modern cellular infrastructure. His story is available here:

Sweden: The Man Who Was Allergic to Radio Waves: Testimony of Electrohypersensitivity. (2025). Blogspot.Com. <https://mieuxprevenir.blogspot.com/2014/07/sweden-man-who-was-allergic-to-radio.html>

¹⁰⁸ Belpomme, D., & Irigaray, P. (2020). Electrohypersensitivity as a Newly Identified and Characterized Neurologic Pathological Disorder: How to Diagnose, Treat, and Prevent It. *International Journal of Molecular Sciences*, 21(6). <https://doi.org/10.3390/ijms21061915>

standardized, foundational scientific evidence required to justify codifying EHS as a new disease.

The CDC must take the initiative to formally recognize EHS, ensuring that individuals dealing with this condition are diagnosed with a *physiological* disease. Far too often, sensitive individuals are misclassified as having a *psychological* illness by health professionals who fail to understand that RF/EMF exposure has the potential to cause health effects with associated symptoms that sensitive individuals can actually *feel*.

Once EHS is finally recognized and codified as the physiological disease that it is, we must develop dedicated clinics and sanctuaries: Because EHS can lead to total functional disability, unemployment, and forced isolation, public health infrastructure must proactively build dedicated low-radiation sanctuaries and specialized environmental medicine clinics capable of safely diagnosing and treating EHS patients.

Beyond the Physical Illness: The *Emotional* Suffering of Living with an Unrecognized Pathology—A Personal Account

Currently, the experience of EHS is not merely physical; it carries a profound *emotional* toll stemming directly from its status as a medically unrecognized disease. My deepest compassion extends to the countless individuals who never found an empathetic ear, and to the families of individuals with EHS whose lives ended prematurely before they could find validation or relief.¹⁰⁹

Explaining EHS to some people presents a unique challenge due to the baseline scientific knowledge required to understand it. Because it isn't even commonly known that everyday devices like cell phones emit microwave radiation, explaining EHS usually requires sharing numerous preliminary science facts first.

Imagine having to give someone a comprehensive physics lesson on the electromagnetic spectrum and a tutorial on specialized RF meters and units of measurement, just to set the stage. This lesson would be followed by a biology refresher on electrochemical gradients and the intricate workings of voltage-gated ion channels in cellular membranes. Only after passing those prerequisites can the conversation begin about EHS as a real disease, which would involve piecing together decades of published data with my own rigorous personal tracking to explain the biological mechanisms of EHS and what effects/symptoms I experience in response to which specific RF sources. Although EHS can be time-consuming to explain, I've found it is most definitely possible if the other person really wants to understand.

It has been deeply disheartening to discover just how few people *do* want to understand. Remarkably, a couple longtime friends who have known me for decades—and who know that my Master's degree in Biology and strong scientific background

¹⁰⁹ One such individual was a teenaged girl named Jenny Fry, who suffered health effects/symptoms from the Wi-Fi at her school. No one from the school would listen, and she was denied even basic accommodations. Jenny's tragic story is told by her mother here: <https://www.odwyerpr.com/story/public/6832/2016-05-04/mother-wi-fi-caused-suicide-victim-tells-tragic-story.html>

should make me a highly credible source—didn't even give me the chance to try to explain my sensitivity to RF electromagnetic radiation. I suspect they had already looked up EHS after I briefly mentioned it before, and they simply fell for the misleading or blatantly false information that currently dominates internet search results.

Because these complex conversations have to be repeated and attempted indefinitely with every new person or old friend unfamiliar with wireless sensitivity, I am frequently left with the distressing feeling of a personal failure to persuade—even though I know it is not my fault. A lingering torment follows every discussion in which the person didn't believe me: I continue to remember facts I wish I had mentioned, wondering if those vital pieces of evidence might have earned me validation if I had thought to talk about them at the time. No one should have to endure this kind of agony just to have their illness recognized by those around them. It is profoundly painful to be repeatedly doubted or dismissed—for *years* on end. It hurts deeply when people are skeptical about the mere *existence* of one's health condition.

Navigating daily life also becomes incredibly complicated when one suffers from a medically unrecognized disease, as demonstrated in the personal experiences shared below:

Ordinary interactions with healthcare providers, repairpersons, and service workers can be challenging, because I have to explain EHS at least briefly so it makes sense why I am asking for certain accommodations (i.e. that no wireless devices are brought onto my property if someone is coming to my home to work on something). Sometimes, these conversations end with my inability to use their services because they are either unable or unwilling to provide just that one basic accommodation.

Living with EHS forces an individual into a recurring dilemma: One must either expend additional energy (and possibly money) searching for a company willing to make a single basic accommodation—leaving wireless devices in their vehicle while working on the property—or accept that completing essential work is going to mean enduring preventable physical suffering, which has the potential to be severe. It is a deeply dehumanizing position to be trapped in.

I consider myself fortunate to have found an accommodating heating and cooling company, a few tree services, and a mobile notary; all of whom treated me with genuine respect and kindness, and conducted their work without bringing any wireless devices onto my property, as requested. Unfortunately, a few other service “professionals” have been dismissive and entirely devoid of empathy—and in one particular case, downright cruel.

For comparison, even during the historical “autism awareness” campaigns, it took nearly twenty years for the public to fully understand and accept a condition that was *already* widely recognized by the medical community. People may still debate autism's causes, but at least its *existence* isn't questioned. With EHS, one is left completely on one's own, desperately trying one's best to convince others, a profoundly taxing and alienating experience shared by countless individuals with EHS.

Throughout my journey of discovering my sensitivity to RF/EMF, I consider myself incredibly fortunate to have had the full support and understanding of my parents, along with a few close family members and friends, who *did* find me to be a credible source of information. They were willing to pay attention to the whole story so they could understand my experience, as well as the related scientific research, to the best of their ability.

For anyone living with EHS, it would be an absolute dream come true if a quick internet search by a friend, neighbor, repairperson, or doctor immediately showed that the CDC recognized it as a *real, physiological* disease. Knowing that the institutional validation was already there—and that one wouldn't have to mentally prepare a speech for every single new personal encounter—would provide a truly monumental sense of relief.

Additional Information

18. Please identify any additional scientific evidence, technical information, data, or recommendations that federal health agencies should consider when evaluating potential adverse health effects associated with RF/EMF radiation exposure.

My specific contributions are already detailed earlier in this discussion.

Thank you again for the opportunity to share my knowledge and ideas to help society move toward a safer, more inclusive future for everyone.

Respectfully submitted,



Tamara J. Filas

In loving memory of my principled and devoted mother, Kathleen Filas.

*We began our discoveries together—now I must continue this arduous journey alone.
Educating all who will listen about the microwaves radiating from their cellular phone.*

*My mother's supportive voice resonates within this work. I speak for Mother Nature too.
Anthropogenic EMFs are disrupting life's fragile balance, but there is something we can do.*

*Unfortunately for my mom, drastic lifestyle changes and protective measures came too late.
The advanced condition of Electromagnetic Hypersensitivity prematurely sealed her fate.*

*But from my grief and sorrow comes my hopeful plea for our country to take the lead.
Biologically-based RF/EMF exposure standards are exactly the solution we need.*