

For the Department of Health and Human Services (HHS):

Re-evaluation of Radiofrequency limits and policies.

I am participating as a member of the public affected by health damage caused by wireless technologies (specifically, by a mobile phone tower) but I will incorporate references from peer-reviewed scientific studies to support what I am going to relate.

My story:

I experienced ten years of progressive decline in my physical and cognitive health with multiple symptoms that doctors couldn't explain (severe sleep disorder confirmed by polysomnography, contractures and intense muscle and joint pain, exercise intolerance confirmed by stress tests, dysautonomia confirmed by tilt table testing, attention, memory, and concentration deficits confirmed by tests, vitamin D deficiency, and hyperparathyroidism). After those ten years without a diagnosis, I received, in this order and over the course of eight years, the following successive diagnoses: fibromyalgia (FM), myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS)—doctors told me these were chronic and incurable diseases—a cellular problem (a 40% deficiency of coenzyme Q10 confirmed by skin biopsy and fibroblast analysis, indicating mitochondrial dysfunction), multiple chemical sensitivity (MCS), and finally, electrohypersensitivity. (EHS). I underwent genetic testing, and no mutations were found in the genes responsible for producing coenzyme Q10 or in my mitochondria. I was a primary school teacher and a secondary school teacher, but physical and cognitive problems prevented me from continuing to work. I was granted disability benefits, and my life was completely disrupted for many years.

I received the diagnosis of electrohypersensitivity after undergoing microwave and low-frequency current therapy for a knee sprain. This treatment, which didn't occur immediately but took several days, caused severe muscle worsening (cramps and involuntary movements of the treated muscles every few seconds) and a decline in my overall health (sleep problems, pain, exercise intolerance, etc.). I was diagnosed with EHS not so much because I had developed new symptoms, but because the cause of the symptoms I had been suffering from for many years had been discovered. This medical diagnosis is supported, in my case, by medical certificates from an endocrinologist, a neurologist, and an internist. I was advised to have my house measured. It was then that I discovered something I was completely unaware of and would never have connected to my symptoms: I had lived for 25 years facing a cell phone tower, located about 250 meters away, whose antenna pointed directly at my house without any obstruction.

When I checked the data on the official Spanish government website regarding that antenna, I discovered that it was emitting between 200 and 2,000 times more than any other antenna or in any other direction. The reason was that there were no antennas beyond my house, and the coverage of a large part of the city was covered by the emissions from that antenna directed toward my house. In 2016, they installed more cell phone antennas, and the emission levels toward my home decreased, but the damage had already been done; the sensitization of my central nervous system and the cellular damage had already occurred. Some symptoms, such as insomnia and muscle tension, began as soon as I moved into that house, but the decline in my health was slow, progressive, and insidious. It reached its peak many years after I moved in and only subsided after I was treated with high doses of coenzyme Q10 and after actively avoiding electromagnetic pollution. My

symptoms are not caused by immediate exposure to EMFs, but rather by chronic and cumulative exposure.

I experienced a worsening of my condition during and after the COVID -19 lockdown, as a new 5G frequency had been introduced to the antenna beforehand. In 2020, I decided to leave my house and move to a rural area where the nearest cell tower is 2 km away and I have no electromagnetic pollution. Over the last few years, I have experienced such improvement that I have fully recovered my physical and cognitive abilities. The symptoms of all the central sensitization diseases that I had been diagnosed with as chronic and incurable have disappeared, and I have also been able to significantly reduce my coenzyme Q10 dosage since moving.

Scientific evidence related to my case:

My experience, supported by scientific studies, leads me to believe that not only electromagnetic hypersensitivity, but all central sensitization disorders (fibromyalgia, chronic fatigue syndrome, multiple chemical sensitivity, and EHS) may be caused by, or at least closely related to, electromagnetic pollution. These disorders are generating enormous medical, occupational, social, and economic costs, are cutting short many lives, and affect millions of people worldwide.

Scientific studies provide ample evidence to support my argument. The effects of wireless technologies have only been regulated for acute exposures and thermal effects, not for chronic exposures or biological effects. Current limits ignore years of accumulated scientific evidence demonstrating health risks even at currently regulated levels.

<https://pubmed.ncbi.nlm.nih.gov/36253855/> ICBE-EMF 2022.

130 years of scientific studies on the biological effects of EMF and RF, from chronic exposures, carried out in Russia, show that, beyond thermal damage, the main biological damage occurs in the central nervous system and in cells.

<https://www.emf-portal.org/en/article/57904> Grigoriev et al 2024 .

https://www.researchgate.net/publication/399258297_Adverse_Effects_of_Electromagnetic_Fields_on_The_Central_Nervous_System_A_Review Oguzhan et al 2025

Cellular oxidative stress, neurological damage, and DNA damage are the effects of RF and the low-frequency EMFs that modulate them that have the greatest scientific consensus, according to the Bioinitiative Report.

<https://bioinitiative.org/>

RF EMFs generate oxidative stress capable of altering cellular function and metabolism:

<https://pubmed.ncbi.nlm.nih.gov/33917298/> Mevissen et al 2021

Damage to the central nervous system, metabolic and cellular problems, alterations in antioxidant levels, and cellular oxidative stress have been described and could explain the symptoms of the so-called central sensitization diseases (we will use this term for practical reasons to refer to FM, CFS, MCS, and EHS, although the damage seems to occur far beyond the central nervous system).

<https://pubmed.ncbi.nlm.nih.gov/18191990/> Yunus 2008

<https://onlinelibrary.wiley.com/doi/10.1111/j.1365-2796.2011.02428.x> Carruthers et al 2011

<https://pubmed.ncbi.nlm.nih.gov/33235303/> Piras et al 2020

<https://pubmed.ncbi.nlm.nih.gov/21845158/> De Luca et al 2011

<https://pubmed.ncbi.nlm.nih.gov/20424583/> Codero et al 2010

<https://pubmed.ncbi.nlm.nih.gov/20417529/> Cordero et al 2011

<https://pubmed.ncbi.nlm.nih.gov/24812443/> De Luca et al 2014

<https://pubmed.ncbi.nlm.nih.gov/27454111/> Velyaev et al 2016

<https://pubmed.ncbi.nlm.nih.gov/32289567/> Stein et al 2020

<https://pubmed.ncbi.nlm.nih.gov/34298941/> Belpomme et al 2021

DNA damage and altered antioxidants have been found in people living near mobile phone base stations.

<https://pubmed.ncbi.nlm.nih.gov/28777669/> Zothansiana et al 2017

French researchers have established a molecular definition of electrohypersensitivity (EHS) by analyzing fibroblasts from affected individuals. They concluded that these cells have difficulty managing their own oxidative stress and exhibit spontaneous DNA breaks and genomic instability. They found that this would make EHS individuals more sensitive than the general population to the oxidative stress generated by ionizing radiation. (It seems logical that this could also make them more sensitive to cellular oxidative stress caused by chronic exposure to non-ionizing radiation.) They characterized two subgroups within EHS individuals: one with a tendency toward premature aging and another with a tendency toward cancer. Further research in this area would be very interesting, including exposing fibroblasts from individuals with EHS and other central sensitization diseases to non-ionizing radiation.

<https://pubmed.ncbi.nlm.nih.gov/40429933/> Sonzogni et al 2025

It is important that the cells of the affected individuals, not the individuals themselves, are exposed to modulated RF radiation. Exposure levels are already regulated to prevent immediate effects, let alone perceived or subjective effects. The most significant damage results from chronic exposure. People should not be chronically exposed to what harms them. If the exposure is occasional, insufficient, or short, it is not enough to demonstrate causality (except in allergy tests, but EHS is not an allergy). This invalidates provocation studies methodologically. Neither ionizing nor non-ionizing radiation is perceptible to the senses, nor should its immediate health effects be subjectively perceived, as the damage occurs at the cellular, metabolic, or neurological level. The studies chosen to verify the health damage of RF should be genetic, epigenetic, metabolic, or proteomic, but on cells, not directly exposing people, as would be done for any other toxicological damage or for any other disease.

<https://pubmed.ncbi.nlm.nih.gov/34229366/> Leszczynski 2021

<https://pubmed.ncbi.nlm.nih.gov/39866356/> Leszczynski 2025

But we will not limit ourselves to EHS: the symptoms and etiology of all central sensitization diseases can be explained, to a large extent, through the effects of low-frequency EMFs and RF on biology and health:

Martin Pall's research has described how central sensitization diseases are caused by the NO/ONOO cycle of cellular oxidative stress, which leads to an excess of nitric oxide and peroxynitrite. Subsequent research by the same scientist identifies electromagnetic fields (EMFs) as the cause of this cycle because they cause the excessive opening of voltage-gated calcium channels in cells, generating cellular oxidative stress and an excess of nitric oxide and peroxynitrite (the NO/ONOO cycle).

<https://pubmed.ncbi.nlm.nih.gov/11461161/> Pall 2001

<https://pubmed.ncbi.nlm.nih.gov/23802593/> Pall 2013

Along these same lines, Dimitris Panagopoulos had been publishing since 2000 that polarized electromagnetic fields (EMFs) produce cellular ionic oscillations that generate excessive opening of voltage-gated calcium channels, causing cellular oxidative stress that affects the cell membrane, ion exchange, and the electron transport chain. According to this researcher, all high-frequency wireless radiation (RF) is modulated by low-frequency EMFs, which are what produce the biological and cellular effects.

<https://pubmed.ncbi.nlm.nih.gov/34617575/> Panagopoulos et al 2021

<https://pubmed.ncbi.nlm.nih.gov/40547468/> Panagopoulos et al 2025

<https://pubmed.ncbi.nlm.nih.gov/42002914/> Panagopoulos et al 2026

EMFs have the capacity to alter mitochondrial function, producing significant changes in certain antioxidant enzymes—which, as we have seen, are also being found to be altered in several of the reviewed studies in people with central sensitization diseases. Oxidative stress is involved in both cancer and aging. EMFs can have therapeutic effects, but they can also have harmful effects if doses and long-term exposure time are not controlled. This calls into question the limits for wireless technologies set by ICNIRP in 2020 or those maintained by the FCC, which only consider acute and isolated exposures, but not chronic exposures.

<https://pubmed.ncbi.nlm.nih.gov/39456490/> Gurham et al 2024

In this regard, the ICNIRP itself acknowledges, in its 2020 review of limits, that one of the mechanisms by which RF can harm health is through changes in the permeability of cell membranes: “If the pulse is intense and brief, exposure to the resulting electromagnetic fields can cause cell membranes to become permeable, which could lead to other cellular changes. However, there is no evidence that the radiofrequency element of an electromagnetic field (without the low-frequency component) can cause sufficient changes in the permeability of cell membranes.” The parenthetical statement inserted by ICNIRP is misleading. Panagopoulos explains that all radio frequencies are modulated with low frequencies. ICNIRP tends to include laboratory studies in its reviews where the radiofrequency is pure and not modulated with other radio frequencies, but in real-world applications, all radio frequencies (mobile phones, antennas, Wi-Fi, etc.) are modulated with low frequencies.

<https://pubmed.ncbi.nlm.nih.gov/32167495/> ICNIRP 2020

Pulsed electric fields are being used in medicine with controlled doses and durations to permeabilize the cell membrane through electroporation, but this can affect voltage sensors, disrupting the entire functioning of the cell membrane. This could lead to pathological effects if exposures are chronic.

<https://pubmed.ncbi.nlm.nih.gov/32559411/> Rems et al 2020

A systematic review compiles the damage to cells and neurons caused by exposure to electromagnetic fields (EMFs). It has been repeatedly demonstrated experimentally that exposing neurons to EMFs in a laboratory, under controlled conditions, causes damage. The central nervous system is particularly sensitive to this damage. The harm is more severe when exposures are chronic.

<https://pubmed.ncbi.nlm.nih.gov/33945157/> Bertagna et al 2021

A systematic review of animal studies reveals the ability of radiofrequency (RF) to alter neurotransmitter metabolism and function, resulting in a disruption of the excitatory-inhibitory balance of neurons and the central nervous system. This leads to, among other consequences, cognitive problems and decreased learning and memory capacity. This imbalance between inhibitory and excitatory neurotransmitters is also being observed in central sensitization disorders.

<https://pubmed.ncbi.nlm.nih.gov/34485223/> Hu et al 2021

<https://pubmed.ncbi.nlm.nih.gov/21913179/> Foerster et al 2012

<https://pubmed.ncbi.nlm.nih.gov/28033157/> Pyke et al 2017

Voltage-gated calcium channels, which we have seen are particularly affected by RF EMFs, are also related to pain, so prevalent in central sensitization diseases.

<https://pubmed.ncbi.nlm.nih.gov/35501819/> Harding et al 2022

RF EMFs are capable of altering the electroencephalogram of animals and humans, revealing changes in brain function and waves (particularly affecting alpha waves, which are associated with relaxation, concentration, memory, and sleep). This, combined with the inhibitory-excitatory imbalance of neurons caused by EMFs, as previously mentioned, could explain the dysautonomia present in central sensitization disorders.

<https://pubmed.ncbi.nlm.nih.gov/40363190/> Torkan et al 2025

<https://pubmed.ncbi.nlm.nih.gov/11812390/> Lyskov et al 2001

<https://onlinelibrary.wiley.com/doi/10.1111/j.1365-2796.2011.02428.x> Carruthers et al 2011

<https://pubmed.ncbi.nlm.nih.gov/34684066/> Murga Gandasegui et al 2021

<https://pubmed.ncbi.nlm.nih.gov/12122925/> Martínez Lavín et al 2002

<https://pubmed.ncbi.nlm.nih.gov/17626612/> Eisinger 2007

RF EMFs are also likely to disrupt sleep. Specifically, interindividual differences have been found that may be influenced by genetic factors.

<https://pubmed.ncbi.nlm.nih.gov/39534742/> Bijlsma et al 2024

<https://pubmed.ncbi.nlm.nih.gov/40541756/> Sousouri et al 2025

<https://jamanetwork.com/journals/jamapediatrics/fullarticle/2571467> Carter et al 2016

<https://pubmed.ncbi.nlm.nih.gov/21489004/> Schmid et al 2012

Electromagnetic fields (EMFs) are being used experimentally to activate and deactivate genes, which can have therapeutic effects but is also likely to produce negative health effects, since cellular electrical mechanisms, membrane potentials, and ion channels appear to underlie this capacity for genetic activation and deactivation. Experiments have shown that certain RF frequencies can modify brain RNA.

<https://pubmed.ncbi.nlm.nih.gov/41985457/> Kim et al 2026

<https://pubmed.ncbi.nlm.nih.gov/33826908/> Levin et al 2021

<https://pubmed.ncbi.nlm.nih.gov/35435088/> Dasdag et al 2022

RF EMFs are likely to amplify the effects of other environmental toxins that are already causing numerous health problems and may also be closely linked to the etiology of central sensitization disorders. We all have a multitude of chemical substances in our blood, and studies suggest that EMFs may be permeabilizing the blood-brain barrier, allowing these substances to reach the brain.

<https://pubmed.ncbi.nlm.nih.gov/31991167/> Kostoff et al 2020

<https://pubmed.ncbi.nlm.nih.gov/33071139/> Sueiro-Benavides et al 2021

<https://esmed.org/MRA/mra/article/view/6253> Havas et al 2025

<https://pubmed.ncbi.nlm.nih.gov/19345073/> Nittby et al 2009

<https://pubmed.ncbi.nlm.nih.gov/25598203/> Tang et al 2015

Eighty percent of those affected by central sensitization disorders are women. There are specific sex differences in the effects produced by electromagnetic pollution. The main factors involved in these differences include the Heart orientation and position, cardiac mass, tissue conductivity, hormonal modulation, autonomic balance, and cortical field organization. Beyond sex, consistent findings demonstrate that biological effects depend not only on field intensity and frequency, but also on polarity (north/south) and the direction (vector angle). These parameters are often overlooked or not reported in published work. Some observations even suggest a direct relationship between polarity and sex, with divergent physiological and behavioral outcomes.

It is essential to conduct sex-differentiated research on the health effects of RF, specifically include women in research, and report research results separated by sex.

<https://pubmed.ncbi.nlm.nih.gov/41618935/> Nelson 2026

Conclusion:

It can still be argued that the current limits for wireless technologies are safe despite all the accumulated scientific evidence to the contrary. Central sensitization disorders can still be treated with antidepressants, which will worsen the underlying cellular and mitochondrial imbalances and damage—initially, after my diagnosis of fibromyalgia and ME/CFS, I was

treated with low-dose antidepressants, and this caused a dramatic deterioration in my health that did not subside until they were discontinued, probably because they were worsening already severely impaired cellular function.

<https://pubmed.ncbi.nlm.nih.gov/10836141/> Wallace et al 2000

If we continue to deny peer-reviewed scientific evidence, the accumulated damage and suffering will result in human, social, labor, and economic costs that may prove unbearable for our economies and societies. It is essential to begin applying the precautionary principle by honestly reviewing current limits in light of current scientific evidence and investing in research and medical training. In particular, it is necessary to investigate the so-called central sensitization diseases that have emerged and spread rapidly in the late 20th and early 21st centuries, affecting billions of people worldwide, predominantly women. Their potential link to electromagnetic pollution should be a priority area for research and prevention.

Risk assessment needs to be different for populations such as children, pregnant women, older adults, people with implanted medical devices, workers with high occupational exposure, people with pre-existing medical conditions, and people affected by central sensitization diseases, for the reasons already stated.

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