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Safety of Wireless Technologies:
The Scientific View



February 2025

"Of the 36 chronic diseases and conditions that more than doubled (1990-2015), the U.S. Navy study warned us of the connection between wireless radiation and twenty-three of those chronic diseases, predicting what has indeed happened to the health of Americans."

"By ignoring the earlier science, U.S. regulators failed to protect the American people from the dangers of wireless technologies. In doing so, they imposed millions of unnecessary chronic exposure conditions on the American public. By 2015, the 23 diseases the U.S. Navy predicted may have added more than $2 trillion in annual health care costs to the U.S. economy due to their negligence."

Co-Authors:

Richard A. Lear. Richard Lear has authored six papers on chronic, germless disease and was the first to quantify the cost and incidence of the U.S. Health Crisis between 1990 and 2015. His paper, *"The Root Cause in the Dramatic Rise of Chronic Disease"*, was also the first to link a common biological profile: a dynamic and synergistic system of 7 bio-factors to all 36 of the fastest-growing chronic conditions in the U.S. Richard is a graduate with honors from Brown University and founder of four technology companies. *Contact:* RichardLear@alumni.brown.edu

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Safety of Wireless Technologies: The Scientific View



Wireless technologies have proliferated since 1990. Until now, the impact of wireless technologies on society has been thought to be largely positive. Wireless technologies offer convenience and empower mobility while delivering wire-free access and instantaneous communications. More than 300 million Americans own at least one wireless device and tens of billions of wireless devices are now in use globally.

We have come to believe that microwave radiation from wireless technologies is safe. Widespread wireless devices like cell phones, tablets, computers, home appliances and even wearables use microwaves just like a microwave oven. So, what does the science actually say?

Voice of the Science

There is an extensive history of scientific inquiry into the biological effects and disease outcomes from low-level exposures to all types of electromagnetic radiation (EMR). The most significant science links microwave and radiofrequency radiation with more than 140 biological effects and dozens of seemingly unrelated diseases. The science speaks volumes if we listen. What follows is a brief history of the landmark science.

The U.S. Naval Medical Research Institute found 132 biological effects and diseases from Microwave Radiation in 1971.

The U.S. Navy has long been concerned with the health impacts from wireless signals generated by communications systems and radar. Beginning in the 1950's, during the Korean War, there were consistent reports of health impacts from sailors, who worked closely with radar. A retrospective Veterans Administration report published in 1976 confirmed substantial increases in health impacts for Navy personnel exposed to wireless signals. These included:

Reported Health Issue		Exposed Incidence %	Non-Exposed Incidence %	% Increase Due to Exposures
Musculoskeletal		16.9	11.9	42%
Systemic Conditions		0.7	0.2	250%
Respiratory		7.3	5.1	45%
Cardiovascular		6.7	4.2	60%
Digestive		7.8	6.76	15%
Lymphatic		0.4	0.3	33%
Endocrine		1.6	1.4	18%
Neurologic		2.3	1.6	44%
Mental Conditions		6.5	5.9	11%
Average Increase in Incidence - Exposed Sailors:				**58%**

Data source: Robinette et al [1]

In 1971, the U.S. Navy reviewed the global science on microwave radiation from wireless signals. Lt. Colonel Zorach Glaser, PhD documented the global science in the meta-study, "Reported Biological Phenomena (Effects) and Clinical Manifestations Attributed to Microwave and Radio-Frequency Radiation".[2] Glaser found 2,311 studies that link low-intensity microwave signals and other EMR with biological impacts. The paper cites 132 different biological effects, symptoms and diseases associated with wireless exposures. The majority of studies examined microwave signals in the 1 to 4 gigahertz (GHz) range at low intensities. These types of wireless exposures are virtually identical with those from modern devices and wireless sources such as cell phones, WiFi, Bluetooth, smart meters, GPS, wearables, and wireless infrastructure.

[1] "Effects upon health of occupational exposure to microwave radiation (radar)", C D Robinette, C Silverman, S Jablon, American Journal of Epidemiology, 1980.
[2] "Bibliography of Reported Biological Phenomena (Effects) and Clinical Manifestations Attributed to Microwave and Radio-Frequency Radiation", Naval Medical Research Institute, October 1971

Below is a sampling of the categories of biological effects, disorders and changes which Dr. Glaser found, linking low level microwave radiation to 132 biological effects and diseases[3].

- Central Nervous System
- Autonomic Nervous System
- Genetic/Chromosome
- Vascular Disorders
- Blood Disorders
- Psychological Disorders
- Enzyme/Biochemical
- Metabolic Disorders
- Endocrine System
- Physiological Function
- Gastrointestinal

More recently publications and review studies have linked wireless and other electromagnetic fields with even more disease and health conditions. Here are findings from the BioInitiative Report, a comprehensive 1,540-page report, first published in 2007, co-authored by a group of 29 international scientists.

The 2012 BioInitiative Report, which was also updated over 2014-2022, cites more than 2,200 scientific studies that associate *low-level* exposures from wireless technologies and other sources of electromagnetic radiation (EMR) with dozens of diseases and biological effects in humans[4]. Here is a sampling:

- Neurological Effects
- Brain Cancer
- Fetal Effects
- Blood Brain Barrier Damage
- Immune Effects
- DNA Damage
- Breast Cancer
- Biochemical Imbalances
- Cancers: Childhood
- Leukemia
- Decreased Fertility
- Oxidative Stress

A key section of the BioInitiative Report, called Henry Lai's Research Summaries[5], in Section 8, may hold one of the most important keys to the wireless health effects connection. For example, Lai reports that 263 out of 288 studies reviewed (91%) link wireless signals to oxidative stress. Most of us know this as free radical damage. This means chronic exposures from cell phones, WiFi and other wireless signals directly inflict changes in cells across our delicate biochemistry. In particular, Dr. Lai's review of the science documents the presence of high levels of peroxynitrite and super oxide in dozens of studies. So why is this so important? These two most pernicious molecules, and in particular the oxidative damages they inflict, are known to radically undermine human health. Peer-reviewed studies show these two molecules

[3] See Appendix A for a more complete list of impacts found throughout numerous biological systems in Dr. Glaser's review of the scientific literature.

[4] "BioInitiative Report 2012", 29 Contributing Authors, Behari, Bellieni, Belyaev, Blackman, Blank, Carlberg, Carpenter, Davanipour, Gee, Fragopoulou, Grigoriev, Mild, Hardell, Herbert, Heroux, Kundi, Lai, Liboff, Li, Margaritis, Nittby, Persson, Oberfeld, PInto, Rajamani, Sage, Salford, Sobel, Thomsen. https://bioinitiative.org/participants/

[5] Dr. Henry Lai's Research Summaries: https://bioinitiative.org/research-summaries/

may ultimately be at the heart of the recent explosion of several dozen chronic diseases and conditions. Studies of other biological effects including neurological, DNA damage, gene expression, fertility and reproductive effects are also included. DNA damage can lead to cancer. Most studies showed biological effects. In particular, a list of 'low-intensity' studies is also included. This list shows that biological effects, possibly adverse health effects, could occur at a radiofrequency radiation intensity much lower than the present international exposure guidelines, suggesting that new revised guidelines are needed.[6]

A year before the 2012 BioInitiative Report was published, in 2011, the World Health Organization (WHO) warned: Microwave radiation from wireless can possibly cause cancer.[7] In a press release on May 31st, the WHO and the International Agency for Research on Cancer (IARC) classified microwave and radiofrequency radiation from wireless technologies as a *possible human carcinogen* (Group 2B).

In these three scientific reviews, above, that together cite more than 4,500 studies on wireless risks, hundreds of scientists present evidence that at least 140 diseases and biological effects are directly linked to exposures from low-level radiofrequency or microwave radiation.

Earlier we asked, "What does the science actually say?" If we stop and listen, the voice of the science could hardly be any clearer.

While *the weight of the science* conveys a consistent and alarming message regarding the dangers of low-level wireless exposures, the public perception is still that wireless technologies are safe. Yet there is no single study that makes that case. Why?

With no evidence for safety and mounting evidence of risk, how did we get here?

The answer to this knotty question is found in the carefully crafted messages by federal agencies, industry groups, the media and clever spins on what the science actually says. But that story is for another day. Instead, let's first look at the evidence of what followed.

What happened to our health since the wireless revolution, beginning in 1990?

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[6] Note, a more recent update of Dr. Lai's Research Studies (November 2024) was published in "Electromagnetic Radiation Safety (2024). "Effects of exposure to electromagnetic fields: Thirty years of research". https://www.saferemr.com/2018/02/effects-of-exposure-to-electromagnetic.html#290

[7] IARC classifies Radiofrequency Electromagnetic Fields as a Possible Human Carcinogen https://www.iarc.who.int/wp-content/uploads/2018/07/pr208_E.pdf

Over 50 years ago the Navy revealed a compendium of science warning us of the potential dangers of wireless back in 1971. With a burgeoning health crisis that has been rapidly unfolding in the U.S., their research now seems prescient. Of course back then few even knew about this topic, and outside of government fewer still were paying attention to it. At the time wireless exposures to the general public were still very rare and low. This was decades before cell phones and other wireless technologies proliferated. It really wasn't until the 1990s when the broader population began to use cell phones and to be chronically-exposed to environmental wireless radiation that some began to ask the question:

Are wireless technologies *really* safe?

U.S. Chronic Disease Health Crisis

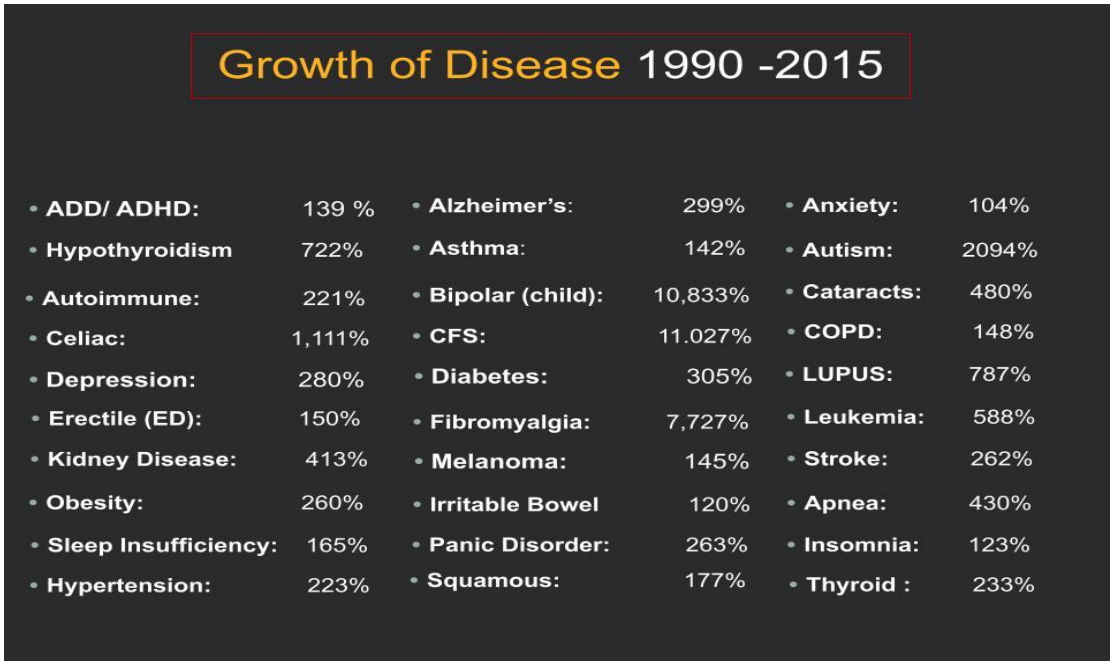
1990 marks the beginning of the current chronic disease health crisis in the U.S. This same year roughly correlates with the beginning of the wireless revolution. Statistics culled from the Centers for Disease Control (CDC), the National Institutes of Health (NIH), and PubMed are staggering. Between 1990 and 2015, in a population of 321 million, the number of instances of the 36 fastest-growing chronic diseases and medical conditions mushroomed beyond 704 million.[8] In a single generation chronic, germless disease had exploded. ***Thirty-six diseases and chronic conditions all more than doubled.***

The annual cost in the U.S. to this unprecedented explosion of chronic disease exceeded $2.6 trillion at the time. It seems the average American suddenly had acquired 2.2 chronic health conditions, up from less than one in 1990.

Many of these diseases and conditions were relatively unknown until the 1990s. Now many are household names: ADHD, COPD, FMS (Fibromyalgia), MS (multiple sclerosis), IBS (irritable bowel syndrome), ED (erectile dysfunction) and BPD (bipolar disorder) to name a few.

Other well-known conditions also exploded: Autism (+2,094%), Alzheimer's (+299%), Sleep Apnea (430%), Depression (+280%), Diabetes (+305%), and Hypothyroidism (+722%).

[8] "The Root Cause in the Dramatic Rise of Chronic Disease", R. Lear, ResearchGate 2016, 2018, https://www.researchgate.net/publication/303673576_The_Root_Cause_in_the_dramatic_rise_of_Chronic_Disease



Source: "The Root Cause in the Dramatic Rise of Chronic Disease", R. Lear, ResearchGate 2016, 2018

Yet, despite the massive amount of evidence to the contrary, the media, federal agencies and the general public doggedly cling to the notion that wireless technologies are harmless (i.e., safe). Regulators have persistently claimed that science showing biological effects is "inconclusive." Yet, no public figure or federal agency will officially proclaim, "wireless technologies are safe." Why? The key problem is that federal agencies like the FCC and FDA reject science that considers low intensity (non-thermal) biological effects of wireless and EMR. This means they refuse to recognize the studies we just discussed. In fact, no study showing biological effects from wireless is able to be considered if the wireless signal fails to clearly heat tissue. This thermal effect limitation opens a convenient loophole. It allows regulators to ignore many thousands of studies showing biological effects from presently permissible levels of wireless and other EMR. It also allows regulators to enforce public exposure guidelines based on a thermal model that were developed originally in the 1950s. At the time, exposures were extremely rare, and usually only found in military and industrial settings, not population-wide exposures, as today![9]

In fact, the FCC and FDA never actually established radiofrequency safety standards themselves. Instead they adopted guidelines based on standards of two NGOs, the American National Standards Institute (ANSI) and the Institute of Electrical and Electronics Engineers (IEEE), essentially outsourcing responsibility to technical organizations without biological experience.

[9] Exposure guidelines were also updated, again based on the thermal model, in the 1980s, determined based only on two experiments in rodents and monkeys (see below), and also in 1996. "Operant behavior and colonic temperature of Macaca mulatta exposed to radio frequency fields at and above resonant frequencies", J O de Lorge, 1984 https://pubmed.ncbi.nlm.nih.gov/6732879/ and "Observing-responses of rats exposed to 1.28- and 5.62-GHz microwaves", J O de Lorge, C. Ezell, 1980 https://onlinelibrary.wiley.com/doi/abs/10.1002/bem.2250010208

Biological Mechanism

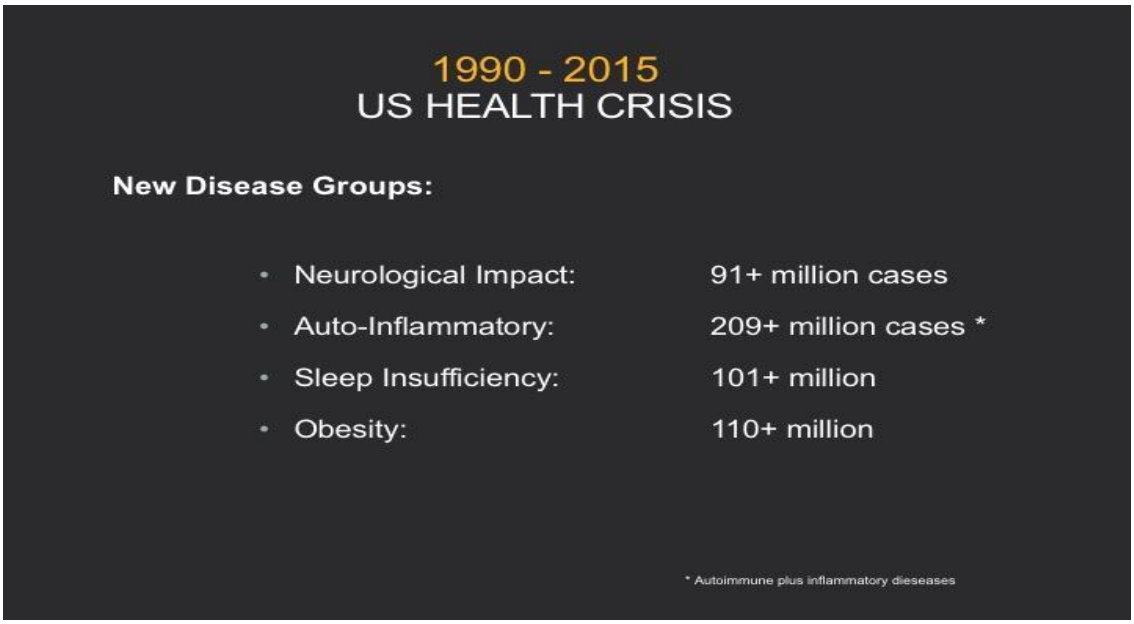


Low levels of electromagnetic energy can affect our health because humans are electrical creatures. Our biological welfare depends critically on a delicate balance of electrical activity. Our brains and hearts utilize electrical impulses to function. EKGs measure the electrical activity of the heart and EEGs gauge the electrical activity in the brain. Trillions of cells exchange electrical messages, which coordinate and orchestrate our body chemistry.

The key components of these bio-electrical communications, which include ions, neurons and neurotransmitters, all depend *crucially* on low-level electrical energy. Even the cells in humans are electrical, operating at around 70 millivolts. Nobel Prize-nominee Dr. Robert Becker, known for his work and research in electrophysiology and electromedicine, details the electrical nature of our bodies in his landmark book, *The Body Electric*.

So, given the electrical nature of our bodies, what happens to the integrity of the "body electric" as levels of electrical energy swell all around us? In particular, when will the most vulnerable to wireless: children, the elderly, and chronically ill persons—pass the tipping point into a state of imbalance and dysregulation?

This question may already be answered by a phenomenon that has quietly unfolded between 1990-2015. Overall health in the U.S. substantially declined during this period, and there has been a dramatic, initially unrecognized rise in four chronic disease categories: neurological, auto-inflammatory, sleep insufficiency, and obesity.



Source: *"The Root Cause in the Dramatic Rise of Chronic Disease"*, R. Lear, ResearchGate 2016, 2018

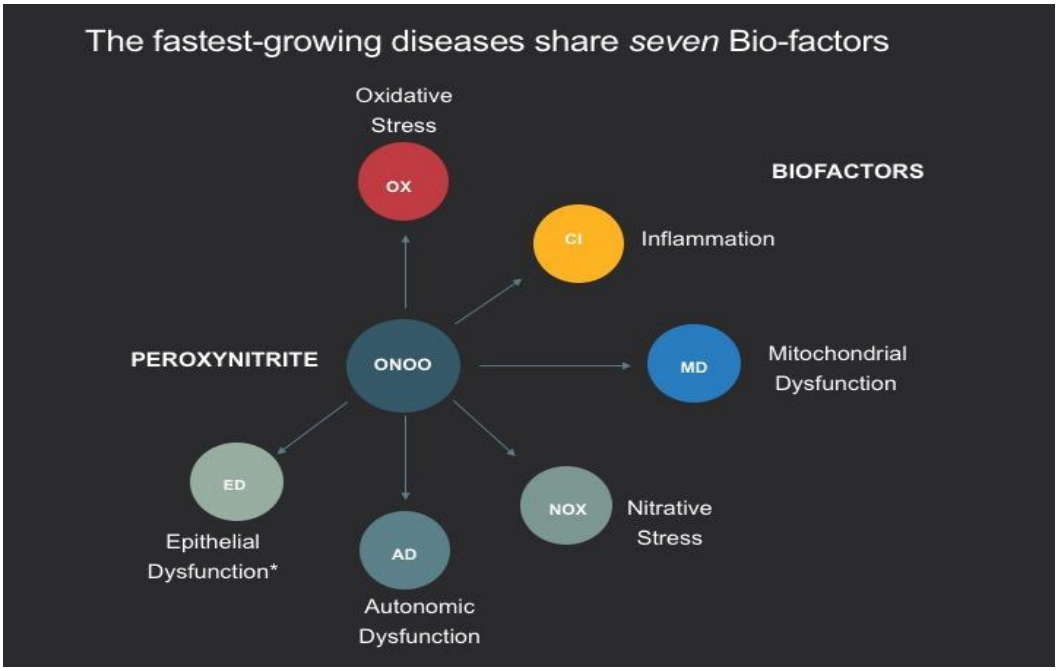
Causative vs. Correlative

While the timing of the proliferation of wireless technologies and the explosion of chronic disease correlates, how can we be sure *wireless energy* is the root cause? Critics remain reluctant to acknowledge the evidence linking wireless and other EMR to disease. They say there is no clear biological mechanism connecting the two. Meanwhile, decades of scientific inquiry actually suggests there may be multiple biological pathways. But with no unifying theory for a single biological mechanism connecting wireless signals to such a wide variety of biological impacts, chronic diseases and health conditions, the argument appears to be a stalemate.[10] Until now.

In one study, Dr. Martin Pall, Ph.D., identifies just such a common biological mechanism. Pall's "Electromagnetic Fields Act Via Activation of Voltage-Gated Calcium Channels to Produce Beneficial or Adverse Effects" (2013)[11] outlines the process by which a *bio-electrical mechanism* enables wireless signals to activate systemic biological chaos and unleash disease. He describes electrically controlled ion channels in cell membranes that act like switches, regulating the flow of ion and affected cell functions. Pall cites 23 studies that link electromagnetic radiation (EMR) similar to that from wireless, with voltage-gated ion channels switching on and off unpredictably, which in turn greatly increases calcium ion (Ca^{++}) inflows, increasing intracellular calcium levels. EMR-triggered changes in calcium ion levels then lead to increased levels of nitric oxide (NO) that generates the dangerous oxidative agent, peroxynitrite ($ONOO^-$).

[10] Note, clarity on mechanism is not a necessary condition for accepting effects.
[11] "Electromagnetic fields act via activation of voltage-gated calcium channels to produce beneficial or adverse effects." J Cell Mol Med. 2013 Aug; 17(8): 958–965. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3780531/

Peroxynitrite has been implicated in more than 60 chronic diseases by the National Institutes of Health (NIH) paper "Nitric Oxide and Peroxynitrite in Health and Disease."[12] This paper details the massive destructive capabilities of peroxynitrite, including at least 97 biochemical disruptions. In an interview with the lead author of the paper, Dr. Pal Pacher, he agreed that peroxynitrite is likely the "smoking gun" for chronic disease. Pacher has authored 260 peer-reviewed publications and is listed among the top 50 most-cited researchers in the world.



The connection between wireless technologies and peroxynitrite is pivotal. When peroxynitrite levels rise in the body, biological systems are thrown into chaos. "The Root Cause in the Dramatic Rise of Chronic Disease"[13] details the association of peroxynitrite with the 36 fast-growing diseases, all of which have more than doubled since 1990. The article identifies a system of six common biological markers for all these germless diseases. They are oxidative stress, nitrative stress, mitochondrial dysfunction, autonomic dysfunction, epithelial dysfunction, and chronic systemic inflammation.

Sitting at the heart of chronic disease, peroxynitrite is both an initator and accelerator of the system and is also independently associated with all 36 diseases.

[12] Pacher P, Beckman JS, Liaudet L. "Nitric oxide and peroxynitrite in health and disease". Physiol Rev 2007 Jan; 87(1)315-424 http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2248324/

[13] "The Root Cause in the Dramatic Rise of Chronic Disease", R. Lear, ResearchGate 2016, 2018. https://www.researchgate.net/publication/303673576_The_Root_Cause_in_the_dramatic_rise_of_Chronic_Disease

Past the Tipping Point?

Statistics on chronic disease suggest millions of people may have already passed the biological tipping point from exposure to wireless and other electromagnetic radiation. Increasing levels of electromagnetic energy in the environment helps explain the dramatic rise in biological dysregulation and chronic disease. In 2003, the World Health Organization (WHO) described background levels of electromagnetic energy around the world as "many orders of magnitude times higher" than the natural environment.[14] Now, in typical U.S. cities, people are exposed to wireless radiation levels 40-100 times higher than those described by WHO just over two decades ago.

The Message Never Got Through

Despite warnings from hundreds of scientists and thousands of studies, linking wireless and EMR to harmful biological effects and disease, the general public in the U.S. has not been sufficiently informed. Somehow, the actual science did not make its way through the tight nets of so many federal agencies.

The FCC, EPA and FDA have failed to warn us of the link between wireless radiation and our health.

In 1971 the U.S. Navy already knew of the dangers of wireless radiation. They knew that these microwave signals were not safe for humans. They had enough data to create safer warships that protected sailors from stray radar signals. Thousands of scientists had tried to warn the rest of us, producing 2,311 studies, reviewed by Dr. Glaser, showing that low-level wireless radiation could disrupt our health in no less than 132 different ways. But the message never got through.

Brave New World

Back then, Navy leadership never imagined a world where a two-year old infant might be playing with a wireless tablet, generating surges of 20,000 microwatts at gigahertz frequencies.



[14] 3rd International EMF Seminar in China: Electromagnetic Fields and Biological Effects, Guilin China, October 13-17, 2003
https://www.scribd.com/document/59705174/Electromagnetic-Fields-and-Biological-Effects-3rd-International-EMF-Seminar-in-China

Nor did they imagine the average American home, or apartment, would be flooded with upwards of 17 wireless signals, spraying microwaves at families 24/7.



Nor could they have imagined a day when millions would be wearing wireless watches and Bluetooth earbuds, each transmitting at 2.5 billion cycles per second right into their brains and bodies.



This was a simpler time when exposure to wireless was limited to AM/FM radio, airport radar and the very occasional satellite passing overhead.

Lt. Colonel Zory Glaser of the U.S. Naval Medical Research Institute compiled the most powerful indictment of wireless ever published. Astonishingly, this was more than 50 years ago. *The study predicted the U.S. Chronic Disease crisis two decades before it even started.*

Of the 36 chronic diseases and conditions that more than doubled (1990-2015), the U.S. Navy study warned us of the connection between wireless radiation and twenty-three, predicting what has indeed happened to the health of Americans. It is true that other factors may have also contributed to the chronic disease crisis in America. For instance, sugar consumption, glyphosate, pesticides and other environmental factors all trigger the production of peroxynitrite. Yet the depth and breadth of the science is overwhelming when it comes to the undeniable connection between wireless radiation exposures and chronic disease.

U.S. Navy Study Predicted Today's 23 Fast-Growing Chronic Diseases – in 1971

Fast-Growing Conditions	Growth Rate 1990-2015	Reported Cases 1990-2015	Similar Biological Effects Cited in Navy Study in 1971
ADHD	139%	5,312,000	Lack of concentration
Anxiety	104%	40,000,000	Anxiety, Increased irritability
Asthma	142%	28,500,000	Increased blood histamine content
Autism	2,094%	4,664,280	Altered fetal development, Alteration in bio currents of the cerebral cortex, Structural changes in cerebral cortex
Cataracts	480%	20,500,000	Cataracts
Chronic Fatigue	11,027%	8,077,200	Fatigue, Memory loss, Lack of concentration, Headaches, Sleeplessness, Depression
Depression	280%	20,304,560	Depression
Diabetes	305%	29,100,000	Blood glucose concentration
Erectile Dysfunction	150%	18,000,000	Impotence, Hypogonadism
Fibromyalgia	7,727%	6,346	Fatigue, Memory loss, Concentration, Headaches, Sleep disorders, Depression
Hypertension	223%	92,799,900	Hypertension
Hypothyroidism	702%	[15]	Thyroid enlargement

[15] Incidence is included in the Thyroid Dysfunction category, below.

U.S. Navy Study Predicted Today's 23 Fast-Growing Chronic Diseases – in 1971

Insomnia	123%	48,396,250	Insomnia
Leukemia	588%	327,520	Leukopenia, Chromosome aberrations, mutations, Neoplastic diseases, tumors
Lupus	787%	563,542	Fatigue, Memory loss, Lack of Concentration, Headaches, Sleeplessness, Depression
Melanoma	145%	996,587	Chromosome aberrations, mutations, Neoplastic diseases, tumors
Sleep insufficiency	165%	100,825,520	Sleeplessness, Insomnia, Circadian Rhythms
Squamous Cell Cancer	177%	322,762	Chromosome aberrations, mutations, Neoplastic diseases, tumors
Stroke	262%	6,800,000	Thrombosis (blood clots)
Thyroid Dysfunction	233%	20,000,000	Thyroid enlargement
Heart Disease	--	125,100,000	Myocardial necrosis, Cholesterol and lipid changes; EKG changes; Vagomimetic action of the heart; Alteration of the heart rhythm
Autoimmune Disease *	221%	24,114,643	Changes in Oxidative processes
Celiac Disease	1,111%	60,000,000	Gastrointestinal disorders
Total Incidence of 23 chronic diseases (2015). Each was predicted by the U.S. Navy study in 1971.		**549,314,860**	

The 549 million figure above is the total number of reported incidences of 23 of the 36-fast growing diseases and chronic conditions reported in 2015. These 23 were linked to biological effects from wireless radiation documented in the U.S. Navy study in 1971.

By ignoring the earlier science, U.S. regulators failed to protect the American people from the dangers of wireless technologies. In doing so, they imposed millions of unnecessary chronic exposure conditions on the American public. By 2015, the 23 diseases the U.S. Navy predicted may have added more than $2 trillion in annual health care costs to the U.S. economy due to their negligence.

Putting the Puzzle Together



The science fits together like a puzzle with a series of interlinking components.

At the heart of it is our core innate immunity. In an effort to fight off foreign invaders, our immune system mounts a powerful defense consisting of free radicals and oxidative agents. These biological weapons have evolved to disable what the immune system perceives as a pathogen – a virus, bacteria, mold or parasite. Yet with wireless energy there is no pathogen present. The ensuing events unfold, which appear as if the immune system attacks itself. But in the case of wireless radiation, our immunity is reacting to invisible, unnatural, man-made energy. Electromagnetic receptors send messages to the immune system signaling the battle is on.

The mechanism and path of causation for wireless health impacts has been laid out in the science. Peer-reviewed science asserts the connection between wireless and more than 140 biological effects and diseases. This association has been extensively reported and confirmed in more than 4,500 studies. While theories such as calcium ion channel disruption have not yet been conclusively proven, the link between wireless signals and peroxynitrite production is widely accepted. Dr. Henry Lai's section in the BioInitiative Report documents 263 studies connecting wireless signals with the production of peroxynitrite, super oxide and other free radicals in the body. Meanwhile, Dr. Pal Pacher's NIH paper links peroxynitrite with more than 97 biological disruptions and 50+ chronic diseases. Of the 704 million reported incidences of the 36-fast growing disease in 2015, nearly 550 million were already associated with the biological factors listed in the 1971 U.S. Navy study. We already knew the dangers of wireless radiation.

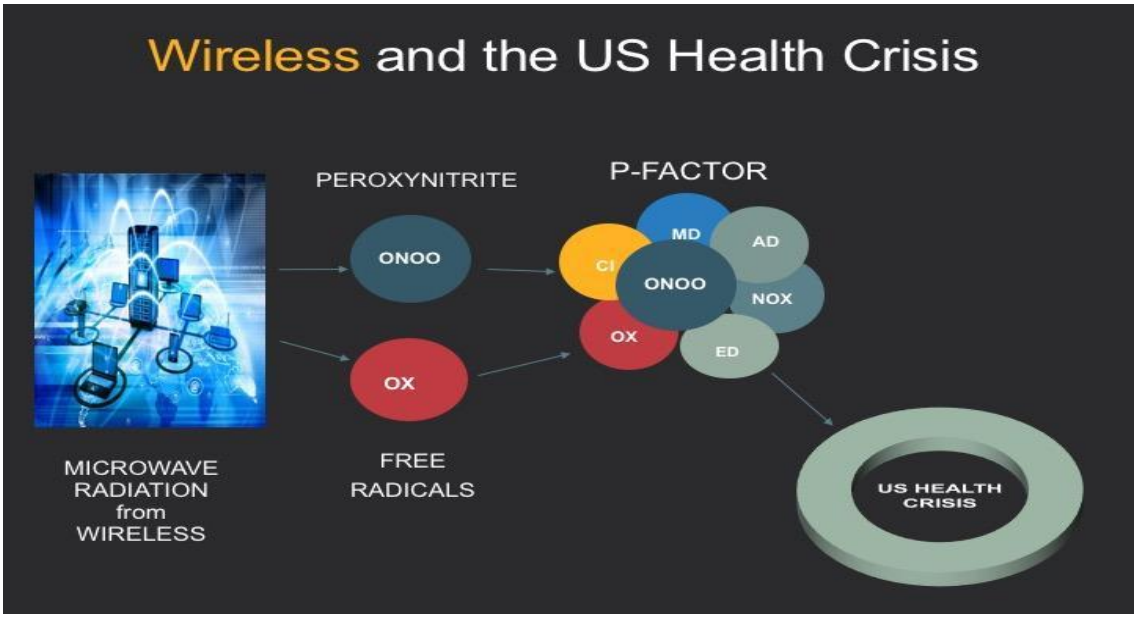
Chain of Causation

Taken together, the research findings from NIH, the U.S. Navy, the BioInitiative Report, and thousands of concerned scientists outline the following chain of causation:

Wireless signals trigger oxidative/nitrative stress in humans. In particular, calcium ion messengers initiate the production of superoxide, peroxynitrite, and other free radicals. These agents not only disrupt biological homeostasis, but evidence points to them creating a lethal system of 7 synergistic biofactors that can both initiate and accelerate disease. This system of dysfunction we'll call "P-Factor." Peroxynitrite sits at the epicenter. It includes systemic inflammation, oxidative stress, mitochondrial dysfunction, autonomic dysfunction, epithelial dysfunction and nitrative stress. P-factor is shared by all 36 of the fastest-growing diseases in the US.

Is P-factor the smoking gun for the current U.S. chronic disease health crisis?

The image below depicts the chain of causation:



Electrical energy from wireless technologies is conveyed in the form of microwave radiation. The electromagnetic frequencies activate calcium ion messengers, which in turn signal the human innate immune system. The perceived threat triggers free radical production like superoxide ($O_2^{\bullet-}$), hydroxy free radical (OH) and peroxynitrite ($ONOO^{-}$).[16] These molecules then set in motion as many as 97 biological disruptions, which are associated with, and appear to be critical factors in, the etiology and persistence of all 36 fast-growing chronic diseases listed above.

[16] Calcium and ROS: A mutual interplay. Agnes Görlach, Katharina Bertram, Sona Hudecova, Olga Krizanova. Calcium communicates with a number of other systems and pathways; among them also with reactive oxygen species (ROS), such as superoxide anion (O2•−), hydrogen peroxide (H2O2) and hydroxyl radicals (HO•). https://www.sciencedirect.com/science/article/pii/S2213231715001007

Elephant in the Room



There is a huge elephant in the room. It is time to begin the honest dialogue on the potential hazards of wireless. We can continue to deny the science but we cannot avoid the tragic consequences of such denial. By denying non-thermal biological effects from microwave radiation, those who are chartered to protect us – our government, our regulatory agencies and our media – have shielded us from the crucial conversation about wireless technologies and our health.

In the U.S., we're facing a tipping point. Chronic disease is dramatically on the rise. Modern stress symptoms from wireless technologies, like fatigue, depression, sleep issues, irritability, mood swings, anxiety, joint pain, brain fog, memory issues, and poor learning, all of which are associated with wireless signals, are plaguing our lives and that of our children. More than 54% of children are suffering from a chronic condition[17]. Four new categories of disease have suddenly exploded since the onset of the wireless revolution around 1990: autoimmune, inflammatory, metabolic, and neurological diseases have become endemic. Millions of people are suffering and not living up to their potential, while bearing the costs of underemployment, financial hardships and health-related bankruptcies. Our nation has been slow to make the connection between our decline in health and our rapidly intensifying electromagnetic environment. As described above, the science is compelling, comprehensively warning us of wireless risks. Meanwhile, the absence of evidence for safety from wireless technologies is chilling.

[17] "A National and State Profile of Leading Health Problems and Health Care Quality for US Children: Key Insurance Disparities and Across-State Variations", Christina D. Bethell PhD, MBA, MPH, Michael D. Kogan PhD, Bonnie B. Strickland PhD, Edward L. Schor MD, Julie Robertson, Paul W. Newacheck DrPH

ARE WIRELESS TECHNOLOGIES SAFE?

The scientific view is clear:

Wireless technologies are not safe.

And we've known this for more than five decades. Now, one crucial question remains:

"When will we have the courage to listen to the science and finally act?"

APPENDIX A:

Following is a sampling of biological impacts from low-level wireless signals, which are identified across 2,311 studies, compiled by the U.S. Navy in a survey of the global science in 1971: "Reported Biological Phenomena (Effects) and Clinical Manifestations attributed to Microwave and Radio-Frequency Radiation":

Central Nervous System Effects

• Headaches • Insomnia • Restlessness	• EEG changes • Cranial Nerve disorder • Pyramid Track lesions	• Reflex disorders • Vagomimetic Action of the heart • Seizures, convulsions

Autonomic Nervous System Effects

• Alteration of heart rhythm	• Fatigue	• Structural alteration of synapses (vagus nerve)

Genetic and Chromosomal Changes

• Chromosome aberrations • Mutations	• Mongolism • Neoplastic Diseases (tumors, cancer)	• Cellular changes (somatic alterations)

Psychological Disorders

• Depression • Impotence • Anxiety • Lack of concentration • Dizziness	• Insomnia • Increased irritability • Memory loss • Sleepiness • Neurasthenia	• Hallucinations • Increased fatigability • Chest Pain • Tremor of Hands • Scalp sensations

Note, the first 10 disorders, above, are key symptoms of Chronic Fatigue, Fibromyalgia, Lupus and psychological stress. Are these psychological or biologically-triggered symptoms, or both?

Blood Disorders

• Blood glucose increase • Histamine content (inflammatory marker) • Decreased erythrocytes • Sedimentation rate	• Cholesterol & Lipids • Gamma globulin • Alpha/beta globulin • Total protein concentrations	• Phagocytes • Shortened lifespan of cells • Blood and bone marrow • Albumin/globulin ratio • Hemolysis rate changes

Changes in Physiological Function

• Decreased fertility • Altered rate of calcification (osteoporosis) • Alteration: menstrual activity • Loss of anatomical parts	• Structural changes in cerebral cortex • Alteration: blood flow • Dehydration • Alteration: diameter of blood vessels • EKG changes	• Myocardial necrosis • Liver enlargement • Sensitivity to light, sound/ olfactory stimuli • Altered color recognition • Altered sex ratio of births (more females)

Gastrointestinal Disorders

• Anorexia • Gastrointestinal disorders	• Epigastric pain • Constipation	• Altered secretion of stomach (digestive juices

Endocrine Gland Changes

• Hyperthyroidism • Thyroid enlargement • Altered adrenal cortex activity • Increased uptake of radioactive iodine	• Altered pituitary function • Low T: Hypogonadism (lower testosterone production) • Lower glucotcorticoidal activity	• Decreased corticosteroids in blood • Change in glycogen concentration in liver • Alteration of ketosteroids in urine

Enzyme and other biochemical changes

• Alteration: cell division
• Increased RNA in lymphocytes
• Decreased RNA in brain, liver, spleen
	• Tissue cultures killed
	• Pyruvic acid, lactic acid, and creatinine excretion
	• Protein denaturation
	• Altered 17 - Ketosteroids
		• Hyperglycemia
		• Changes in:
		  ○ Cholinesterase
		  ○ Phosphatase
		  ○ Transaminase
		  ○ Amylase

Metabolic Disorders

• Glycosuria (sugar in urine) • Altered: rate of Metabolic process	• Increase in Urinary Phenol	• Altered carbohydrate metabolism

Vascular disorders

• Thrombosis (blood clot)	• Hypertension	

Miscellaneous Effects

• Changes in circadian rhythms • Hair loss • Brittleness of hair	• Metallic taste in mouth • Sensations of buzzing, vibrations, pulsations, tickling about head and ears	• Changes in optical activity • Sparking between dental fillings • Copious perspiration, salivation diseases

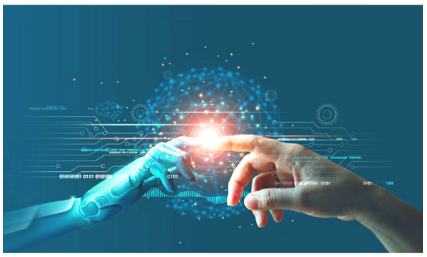
Pearl Chain Effect

• Changes in intracellular orientation of subcellular particles

APPENDIX B:

A comparison of Radiofrequency Radiation Exposure Standards from around the world:

	Microwatts/ square meter
US	5,800,000
Russia	100,000
China	60,000
Italy	50,000
Switzerland	42,000
Salzburg, Austria	1,000



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