

# Dirty Electricity: Invisible role in the US Health Crisis?

By Richard Lear

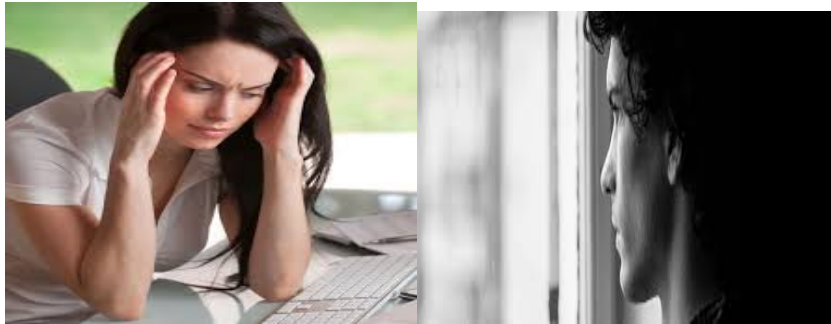
**Abstract:** a dramatic rise in chronic disease, medical conditions and stress symptoms have arisen in the past thirty years in the US. Between 1990-2015 Americans experienced a surge of more than 400 million cases of just thirty-six fast growing germless chronic conditions. This calculates to about 1.3 cases of a new chronic condition per US citizen at an average generational disease rate of more than 167%.

These diseases and conditions are manmade and thought to be caused by something in our diet, lifestyle or environment. One major environmental factor to consider is the increased exposures to electromagnetic radiation (EMR). EMR is statistically correlated with the sudden US disease spike. There is also increasing evidence of a plausible mechanism. At least one causal model details the biochemical-electrical mechanism, which is ironically tied to the innate immune response to environmental stress. The two principal areas of EMR under investigation are 1) microwave radiation from wireless technologies such as cell phones, mobile transmitters and devices, Wi-Fi, computers, GPS and smart meters; and 2) dirty electricity. Dirty electricity is a “coined term”, which describes the electromagnetic interference (EMI) and radiation caused by devices, appliances and green technologies plugged into electrical circuits in buildings. A dramatic increase of electronics and green technologies like solar power systems, compact fluorescent lights and electronics with AC adapters has served to create and exacerbate this problem. This paper will focus principally on the impact on our health and wellness from dirty electricity, though most forms of EMR are thought to act through a common mechanism.

Dirty Electricity refers to a fast-growing form of potentially harmful electrical energy that radiates into living environments from electrical wiring. It's highly unstable and raises the ambient voltage in living environment by as much as two volts. This environmental toxin arises from electromagnetic interference (EMI) caused by plug-in electronics, computers, fluorescent lighting, modern appliances, battery chargers, smart meters and solar power systems.



Recent science has shown dirty electricity to be *bioactive*. <sup>(1, 2)</sup> That is, it directly disturbs human biological systems. Dirty electricity and other types of chaotic electrical energy <sup>(3)</sup> have been associated with auto-immune disease <sup>(1,4,5,6)</sup> neurological conditions <sup>(1,4,5,6)</sup>, poor sleep <sup>(1,6)</sup>, attentional disorders <sup>(1,4,5,6)</sup>, anxiety <sup>(1,4,5,6)</sup> and dozens of chronic symptoms associated with inflammation <sup>(1,4,5,6)</sup>.



Here is a sampling of health impacts, which are scientifically-associated with dirty electricity:

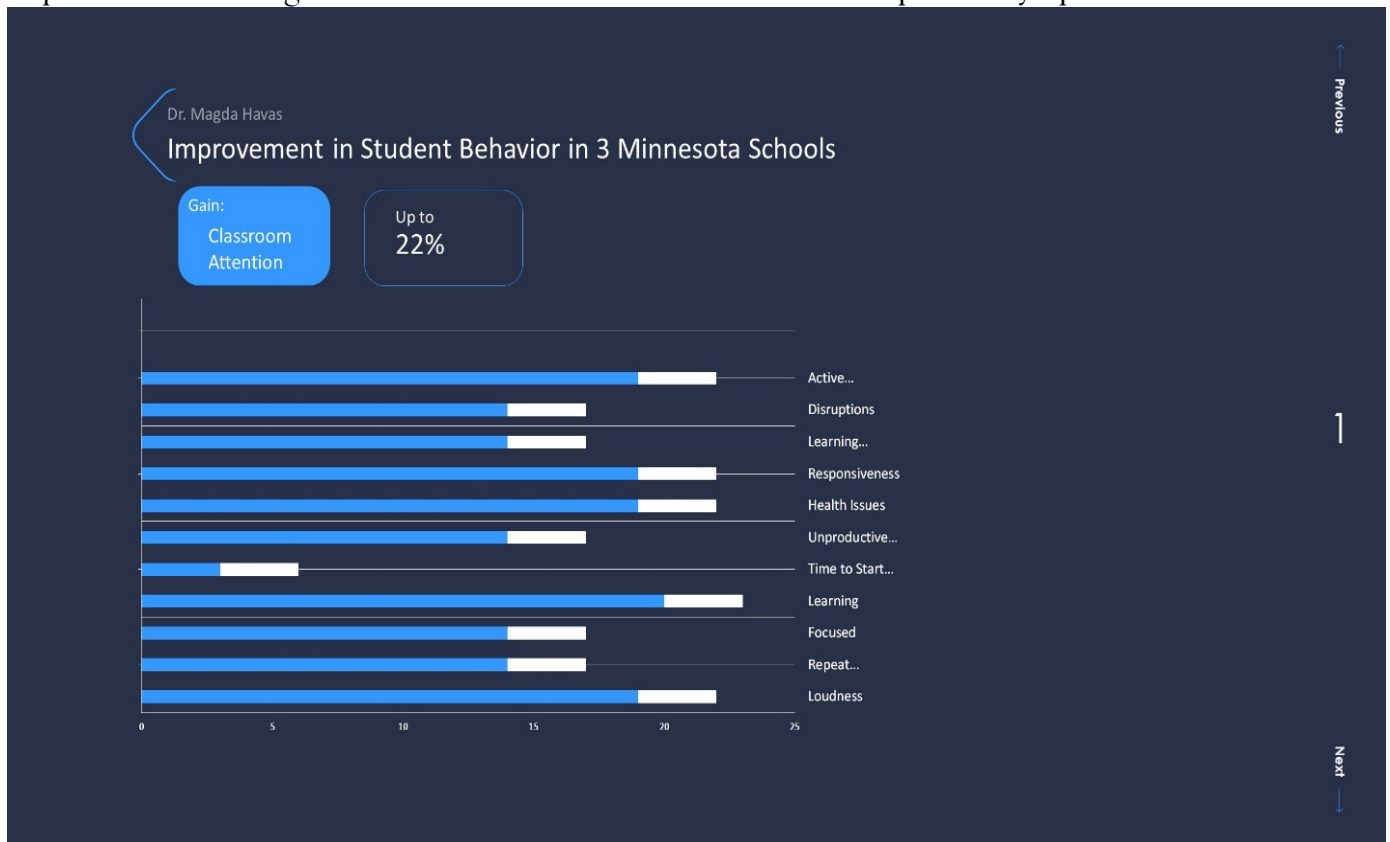
<b>ADHD</b> <sup>(1)</sup>	<b>Diabetes</b> <sup>(3)</sup>
<b>Anxiety</b> <sup>(1)</sup>	<b>Fatigue</b> <sup>(1)</sup>
<b>Asthma</b> <sup>(1, 4)</sup>	<b>Irritability</b> <sup>(1)</sup>
<b>Cancer</b> <sup>(2)</sup>	<b>Pain</b> <sup>(1)</sup>
<b>Concentration</b> <sup>(1)</sup>	<b>Mood</b> <sup>(1)</sup>
<b>Cancer</b> <sup>(1)</sup>	<b>Multiple Sclerosis</b> <sup>(1)</sup>
<b>Depression</b> <sup>(1)</sup>	<b>Sleep Issues</b> <sup>(1)</sup>

**Dirty Electricity – another name for EMI:** Dirty electricity is a term coined by the electrical utility industry to describe electromagnetic interference (EMI) caused by plugging in electronics, which typically need to convert alternating current (AC) electricity into the direct current (DC) to operate. The term was first mentioned in the science by Dr. Magda

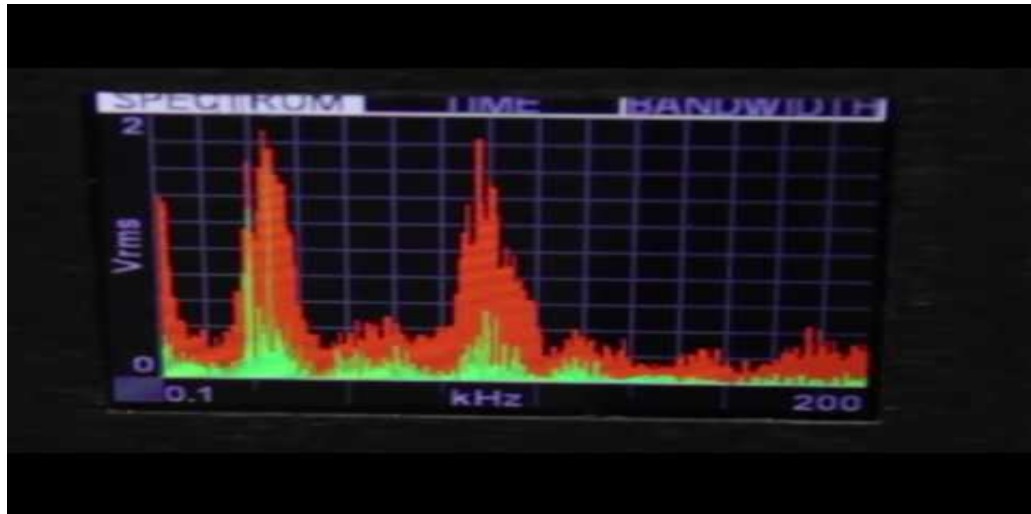
Havas, PhD and Dr. Samuel Milham, MD, who have both identified a series of health effects associated with dirty electricity (power line EMI) in a half dozen scientific papers.

**Dirty electricity exists everywhere.** Some levels of dirty electricity are found in almost every building whether it be in homes, work, schools, or in public places. Wherever electronics like computers, battery chargers, Wi-Fi, TVs, game consoles, compact fluorescent lighting or solar panels operate the electrical circuits are likely radiating dirty electricity.

**Dirty Electricity is unusable and potentially harmful.** Dirty electricity is a by-product of using modern electronics. It is not only unnecessary to power our homes and businesses, but can harm electronics and interfere with sound systems. It is also poses challenges to our health. It has been postulated that this potentially harmful energy radiates into living environments and couples to our bodies as an electrical charge. [One crucial scientific study](#)<sup>1</sup> performed by Dr. Havas shows how removing dirty electricity from schools improves the learning environment. 11 of 13 ADHD behaviors improved by up to 22%.



**What does Dirty Electricity look like?** [Here is a visualization](#) of the erratic electrical energy produced by dirty electricity.



There is increasing scientific evidence that these invisible spikes and surges radiating from electrical circuits may be triggering an immune system response. In a key section from the [BioInitiative Report](#),<sup>4</sup> Dr. Olle Johansson, PhD shows how electrical fields trick the innate immune system into thinking the body is being attacked by a foreign invader like a virus or bacteria.

Johansson observed a proliferation of mast cells, which react to various classes of electromagnetic radiation (EMR) in humans after exposures. Mast cells signal the release of inflammatory substances, which when chronically provoked, enter a repetitive loop. There is increasing evidence that *chronic* exposures to electrical fields like dirty electricity produce a *chronic* inflammatory response. This chronic inflammation eventually exhausts the adrenal glands and leads to fatigue, cognitive impacts, fuzzy thinking, irritability, anxiety and memory loss. Chronic electrical exposures trigger symptoms, which mirror those experienced in dozens of autoimmune diseases.

## Drilling down: What Causes Dirty Electricity?

Dirty electricity is an erratic form of electromagnetic energy (EMI), which is generated by electronic devices, as they operate. As mentioned earlier, the key problem is that most modern electronics operate on direct current (DC) at around 12 volts, while electrical circuits convey electrical energy, using alternating current (AC) at 120, or 240 volts. Modern electronics convert the AC power to DC, and in so doing, create *dirty power* in the form of electromagnetic interference. Imagine that crackly sound when AM/ FM radio is tuned between stations. [Here is what dirty electricity sounds like.](#)

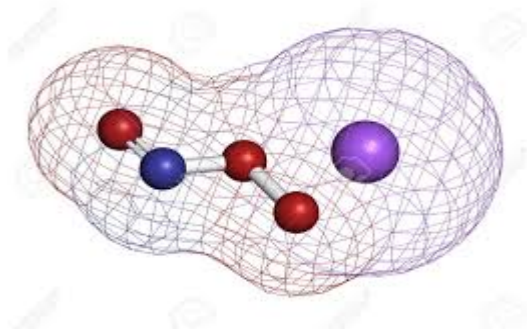


EMI circulates through a building's electrical system and radiates into the environment through wiring, outlets, power strips, and electronics and efficiency lighting, contaminating the environment with electro-pollution.

**Is dirty electricity dangerous?** Scientific evidence points to a connection between electrical energy and a wide variety of medical, emotional, and cognitive health problems.

There are now more than 5000 studies which link electromagnetic energy with biological effects, chronic conditions and dozens of diseases. <sup>(4,5)</sup>

Dirty electricity is one form of electrical energy, which may trigger a single destructive molecule in the body called peroxyntirite. This molecule is formed with nitric oxide (NO) and superoxide ( $O_2^-$ ). When found together they form the highly destructive  $ONOO^-$ .



**Peroxyntirite  $ONOO^-$  is associated with electromagnetic radiation.**

The peroxyntirite molecule creates more than 100 biochemical disruptions in humans and has been associated with more than 60 chronic diseases <sup>6</sup> affecting more than 170 million Americans. According to “[The Root Cause in the Dramatic Rise of Chronic Disease](#)”<sup>7</sup>, 36 of the fastest growing diseases and chronic conditions in the US, which have all more than doubled since 1990, share high levels of peroxyntirite. Here is a sampling of the growth of chronic disease in the US:

## Growth of Disease since 1990

• <b>ADD/ ADHD:</b>	139 %	• <b>Alzheimer's:</b>	299%	• <b>Anxiety:</b>	104%
• <b>Hypothyroidism</b>	722%	• <b>Asthma:</b>	142%	• <b>Autism:</b>	2094%
• <b>Autoimmune:</b>	221%	• <b>Bipolar (child):</b>	10,833%	• <b>Cataracts:</b>	480%
• <b>Celiac:</b>	1,111%	• <b>CFS:</b>	11.027%	• <b>COPD:</b>	148%
• <b>Depression:</b>	280%	• <b>Diabetes:</b>	305%	• <b>LUPUS:</b>	787%
• <b>Erectile (ED):</b>	150%	• <b>Fibromyalgia:</b>	7,727%	• <b>Leukemia:</b>	588%
• <b>Kidney Disease:</b>	413%	• <b>Melanoma:</b>	145%	• <b>Stroke:</b>	262%
• <b>Obesity:</b>	260%	• <b>Irritable Bowel</b>	120%	• <b>Apnea:</b>	430%
• <b>Sleep Insufficiency:</b>	165%	• <b>Panic Disorder:</b>	263%	• <b>Insomnia:</b>	123%
• <b>Hypertension:</b>	223%	• <b>Squamous:</b>	177%	• <b>Thyroid :</b>	233%

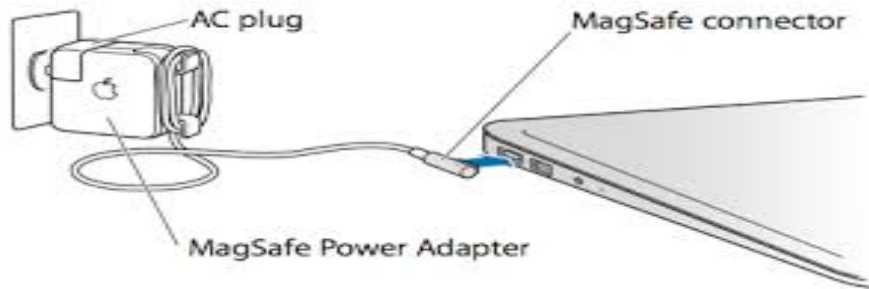
In his landmark study, [“Electromagnetic fields act via activation of voltage-gated calcium channels to produce beneficial or adverse effects,”](#)<sup>(11)</sup> Dr. Martin Pall, PhD of Washington State University shows how electrical energy triggers high levels of intracellular calcium ions, which in turn, causes releases of high levels of nitric oxide, which is a chief precursor to peroxynitrite. Later in the paper, we will explore the pivotal role of peroxynitrite in the 36 fast-growing diseases. The connection between electrical energy like that produced by dirty electricity (EMI), peroxynitrite and the 36 fastest growing diseases is outlined in [“A New Era of Disease in America and what’s behind it.”](#)<sup>(7)</sup>

### **How dirty electricity may lead to disease and chronic conditions**

Let’s say you plug an electronic device like a computer or a cell phone battery charger into an electrical outlet. The device, which runs on direct-current (DC) electricity must convert



alternating current (AC) electricity, which is provided by the electric company, to DC to operate. The AC plug (adaptor) below is converting AC to DC.



By converting AC to DC electricity and stepping down the voltage from 120 volts to 12 volts, a *measurable* side-effect of wasted electrical energy is created in the form of electromagnetic interference (EMI). A surge of electrical energy radiates into living environments in the form of voltage *transients* and spikes. These are erratic forms of electrical energy, which are rapidly changing in intensity. [See how dirty electricity is measured and hear the amplified noise it creates below.](#)





Some believe human exposures to this surge in voltage caused by various classes of EMR like dirty electricity (EMI) can lead to biological changes. Dr. Martin Pall demonstrates an activation of voltage-gated ion channels (VGIC) at the cellular level. This activation creates inward and outward flows of unhealthy levels of calcium ions. Calcium itself can be toxic at the cellular level. But even more critical: this rise in calcium ions triggers a rise in nitric oxide (NO). As mentioned earlier, nitric oxide is a critical precursor to peroxynitrite, which NIH scientists have linked with at least 60 chronic diseases.

At a biological level, the drama is played out in a spectacular series of biochemical changes, which disrupt biological balance (homeostasis). High levels of peroxynitrite create free radicals, which damage proteins and lipids (critical fats), perforate both the blood brain barrier and stomach lining; and decrease the production of critical neurotransmitters such as serotonin and dopamine. Low levels of these neurotransmitters are associated with anxiety, depression, irritability, lack of empathy and many neurological diseases. Peroxynitrite also creates *mitochondrial dysfunction*, which undermines the primary energy center for all cells in the body. The result is impaired neurological function, organ dysfunction, brain fog, memory issues and fatigue.

### **More science connecting dirty electricity to disease**

Dr. Sam Milham, who authored [one of the most powerful studies on dirty electricity and cancer](#),<sup>2</sup> has spent nearly thirty years researching the impact of electromagnetic fields (EMFs) on health. In his book, *Dirty Electricity: Electrification and the Diseases of Civilization*, Dr. Milham provides the epidemiological link between dirty electricity and cancer, heart disease, diabetes, Alzheimer's, suicide and neurological disorders such as multiple sclerosis (MS) and ALS (Lou Gehrig's disease).

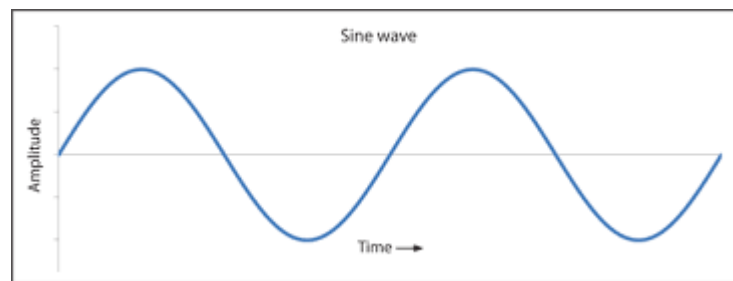
### **Waveform Matters**

Dirty electricity (EMI) is just one form of electromagnetic radiation. People ask how very low intensities of dirty electricity, often measured in picowatts (trillionth of a watt), could possibly be bioactive. The intensity of other EMR's like those from radiofrequency (RF)/microwave (MW) radiation, which powers wireless technologies, typically reach into

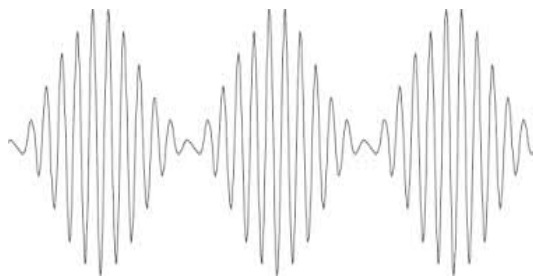
microwatts (millionth of a watt) or milliwatts. The answer is puzzling. Some scientists counter that the chaotic nature of dirty electricity, which is characterized by spikes and surges, may be the key. These researchers believe that non-standard waveforms are particularly antagonistic to biological systems, irrespective of intensity.

## New Waves

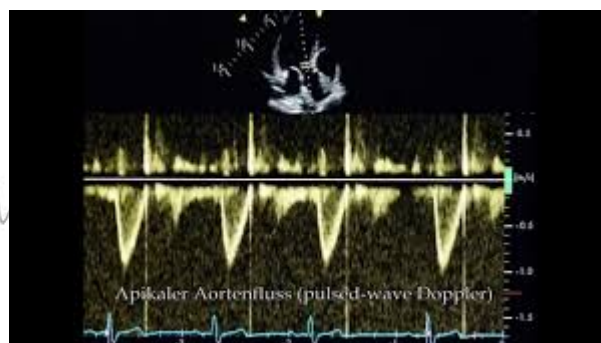
In his presentation, **Non-thermal biological effects of microwaves**, Igor Belyaev demonstrates the highly bioactive nature of non-sinusoidal waveforms. These are waves that dramatically differ from the smooth sine wave shown below.



These relatively new waves to our planet include square and saw tooth waves; plus modulated waves and pulsed waves – almost any waveform that is either non-continuous or unlike a sine wave.

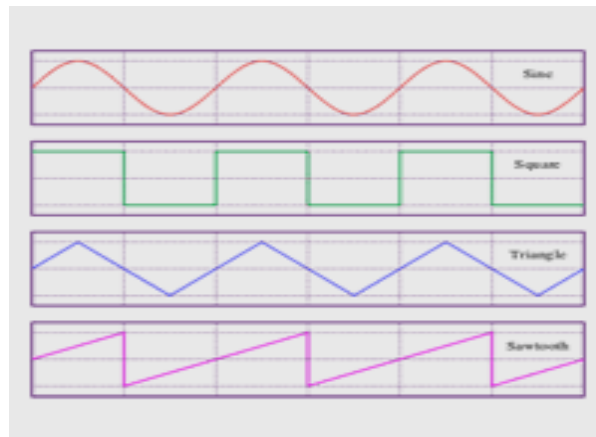


**Amplitude Modulation**



**Pulsed Waves**

Below you will see the comparison in waveforms between a smooth sine wave and three manmade waveforms with sharp edges: the square wave, triangle wave and saw tooth wave.



Until the 20<sup>th</sup> century, humans never experienced electrical fields with waveforms as complex as these. Now these types of waves are so dominant in electronics that the average suburban dweller is being bombarded by up to 1200 signals using non-continuous and/or non-sinusoidal waves 24 hours a day.

Our bodies, which are highly conductive, have evolved successfully to generally coexist with low-level exposures to naturally occurring sine waves. Millions of years of evolution ensures this adaptation. Yet, many new waveforms and electrical modalities have emerged in the past half century. How well are humans adapted to enduring chronic exposures to pulsed waves, digital transmission, saw tooth waves or modulated frequencies?

### **Chain of Causation**

Since the 1970s, scientists have linked dirty electricity and other forms of EMR with profound and chronic health impacts. A US Navy Study<sup>5</sup>, which surveyed more than 2300 global studies, linked microwaves, like those from cell phones, Wi-Fi, GPS, game consoles and computers, with 132 biological effects. (See appendix B for a summary) Even at low-levels, exposures to this form of electrical energy disrupts homeostasis. Yet many still remain skeptical of whether low-level exposures to EMR from wireless, electrical devices or even dirty electricity can really affect biological systems without heating.

## **Health Impacts from EMR exposures at low levels?**

People are increasingly asking: can low-levels of electromagnetic radiation (EMR) really affect our health? The short answer is yes. Yet, despite the findings of the US Navy study plus thousands of others that confirm this, US regulators remain unmoved. Federal agencies like the FCC and FDA claim that EMR from wireless signals, electronic devices, or even dirty electricity, can only cause biological effects if it is strong enough to heat tissue. This is called the *thermal effect*. This conclusion is made by bureaucrats and regulators, not scientists. It ignores more than 5000 studies, which associate biological effects and disease from low-level exposures to EMR. These are levels of EMR which do not heat tissue. Now the real-world results of such a tragic miscalculation may be playing itself out in the US. According to recent government statistics, a dramatic US health crisis has unfolded since 1990. About the same time as electronics, devices and green technologies began to proliferate, driving high levels of dirty electricity, the *wireless revolution* began in the US. Both trends correlate with the onset of dramatic disease growth.

## **US HEALTH CRISIS**

170 million Americans are now suffering from at least one of 36 fast-growing chronic diseases or conditions which more doubled between 1990 and 2015.<sup>10</sup> In fact, on average, every American is now suffering from 2.1 of these conditions. And there appears to be more than just a correlative connection to EMR. Here's how the chain of causation unfolds.

### **EMR → Internal Biological Chaos → Chronic Disease**

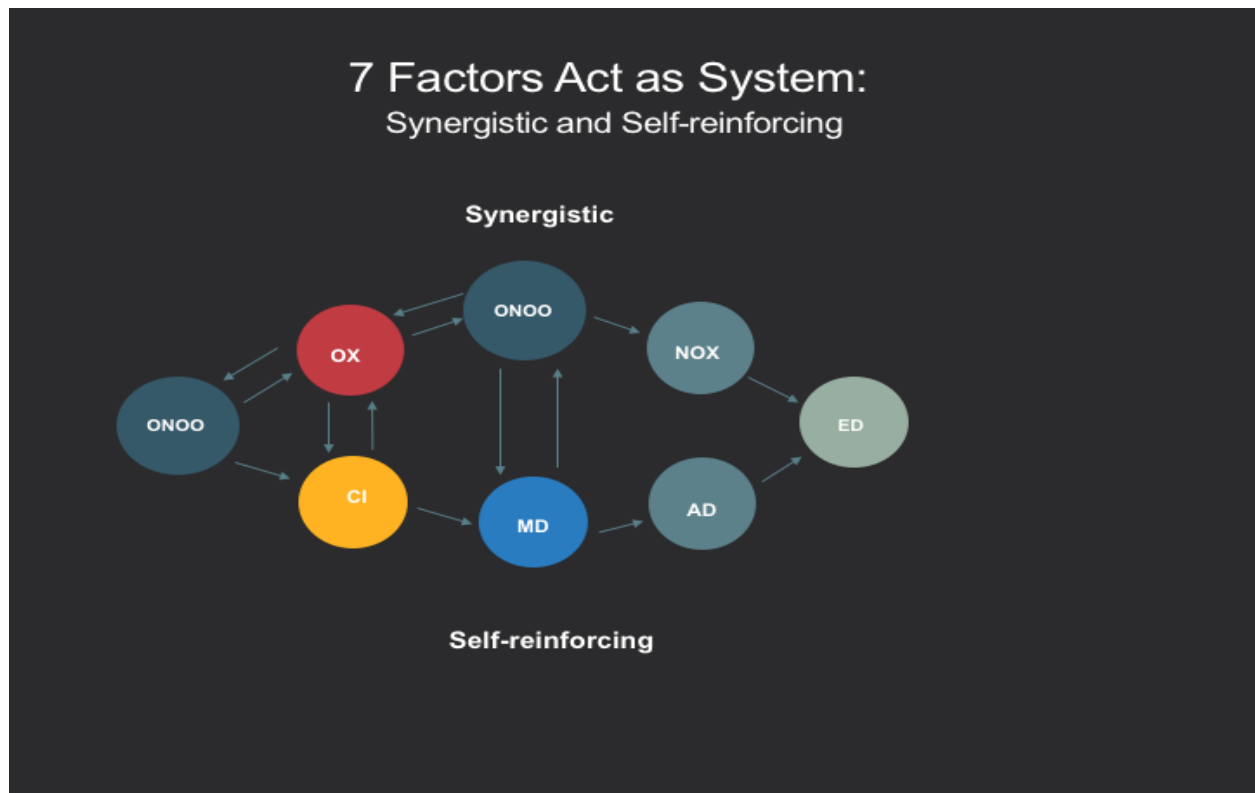
#### **P-Factor: The Heart of Biological Chaos**

The current US health crisis is made up of 36 fast-growing conditions, each of which is scientifically-linked with seven *shared* bio-markers. When taken together, we call this biological fingerprint, **P-Factor**. P-Factor acts like a self-reinforcing biological system, which cause dozens of bio-chemical disruptions. This virtual system of chaos is both caused by and accelerated through the presence of high levels of a single, devastating molecule called

peroxynitrite. As discussed earlier, an elite scientific team from NIH brilliantly described the destructive capabilities of this single molecule in their landmark 2008 study <sup>(6)</sup>.

## P-FACTOR

Peroxynitrite is represented in the P-Factor system as ONOO below.



This graphic shows the key bio-markers, which constitute P-Factor:

### P-Factor:

- ONOO – peroxynitrite
- NOX – nitrative stress
- OX – oxidative stress (prevalence of free radicals)
- CI – chronic inflammation
- MD – mitochondrial dysfunction
- AD – autonomic dysfunction
- ED – epithelial/ endothelial dysfunction

Could these key bio-markers fundamentally define the *state of chronic, germless disease*?

Scientific literature suggests P-Factor acts like a synergistic system where the individual bio-markers interact to reinforce biological damage. For instance, Dr. Martin Pall has identified ‘vicious cycles’ that exist within P-Factor. He notes how the self-sustaining and promoting properties exist between bio-markers like oxidative stress (OX), chronic inflammation (CI) and mitochondrial dysfunction (MD). For example, chronic inflammation leads to more oxidative stress and, in turn, this rise in oxidative stress leads to increased inflammation.

Even more troubling is peroxynitrite’s role in disrupting the mitochondria. Every cell in the body is powered by the energy-creating capabilities of the mitochondria. Yet once peroxynitrite disrupts the electron transport chain, the mitochondria quickly lose its ability to create core cellular energy, called ATP. In a profound irony, increases in peroxynitrite in the mitochondria actually causes the production of more peroxynitrite.

### **Factory for Cellular Energy (ATP) is hijacked**

What nature designed to be our core factory for the production of cellular energy is being hijacked by peroxynitrite. Like a parasite, this molecule has converted the end-product of what should be an energy factory into a more of this highly-destructive product. The assembly line in the mitochondria is now creating peroxynitrite, instead of pure cellular energy. The reinforcement and self-sustaining characteristics of P-Factor help explain the chronic nature of chronic, germless disease. So, what triggers this entire chain of internal, biochemical events? Is there some external force that sets P-Factor in motion? Following, let’s examine possible triggers with a focus on the possible connection between EMR and P-Factor.

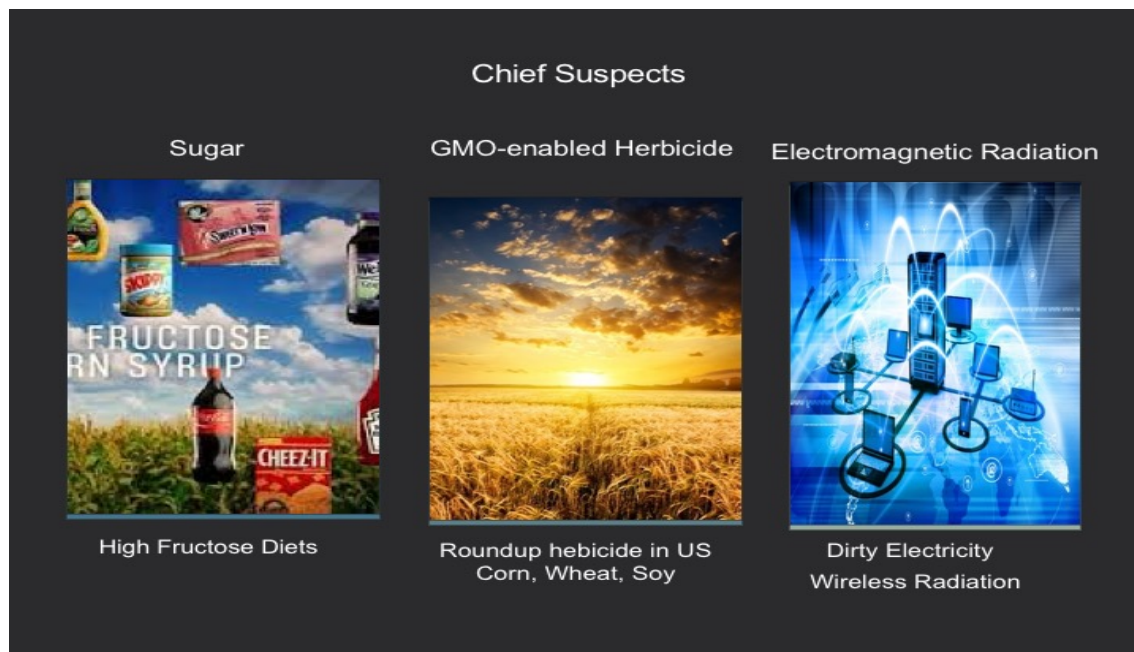
### **External Triggers and P-Factor**

Government statistics show that in the past three decades, we’ve entered a new era of chronic disease. The US health crisis is characterized by a dramatic rise in the *diseases of civilization*. These are manmade diseases where germs are not to blame.

## Diet, Lifestyle and Environment

In this new era of disease, the root causes cannot arise from bacteria, viruses, parasites and/or mold. Instead, scientists believe the root causes can be found somewhere within our diet, lifestyle or environment. Thus, if P-Factor is an internal biological mechanism for chronic disease, what, then, triggers P-Factor from without?

Multiple possible external triggers exist. These three show the greatest correlation:



## Correlation and Causation

Establishing a credible scientific link between the US health crisis and each of these triggers is relatively straightforward. Determining causation typically means establishing both 1) statistical correlation and 2) establishing plausible biological mechanisms. Here is the case for statistical correlation:



## Growth in Environmental Triggers

• <b>Sugar:</b>	1970-1990	1087%
• <b>Round-up ready Crops</b>	1990-2015	3025%
• <b>Electrical Energy</b>		
• Wireless Radiation	1990-2015	6085%
• Dirty electricity (EMI)		(exponential)

In order to establish a causative relationship, we need more. We need to establish a plausible mechanism. Let's take a look at what the science says.

### **EMR and P-Factor**

Ten of the most often-cited biological impacts from EMR are also directly linked with the effects from peroxynitrite. Further, all are biologically linked with the other six bio-factors. The linkages are mainly through inflammation and free radical production (oxidative stress).

The connection between EMR and the trio of peroxynitrite, inflammation and oxidative stress is uncanny. Everywhere you look, the science links the coincidence of: 1) EMR, 2) peroxynitrite; 3) oxidative stress; and 4) systemic inflammation as if it acts as biological pathogen unto itself. Here's a summary of the scientific connection between EMR and P-Factor and its chief components:

- EMR causes oxidative stress: a trigger of P-Factor
- EMR causes peroxynitrite: the chief accelerator of P-Factor
- EMR both directly and indirectly causes inflammation: primary outcome

## Mechanisms of Environmental Triggers

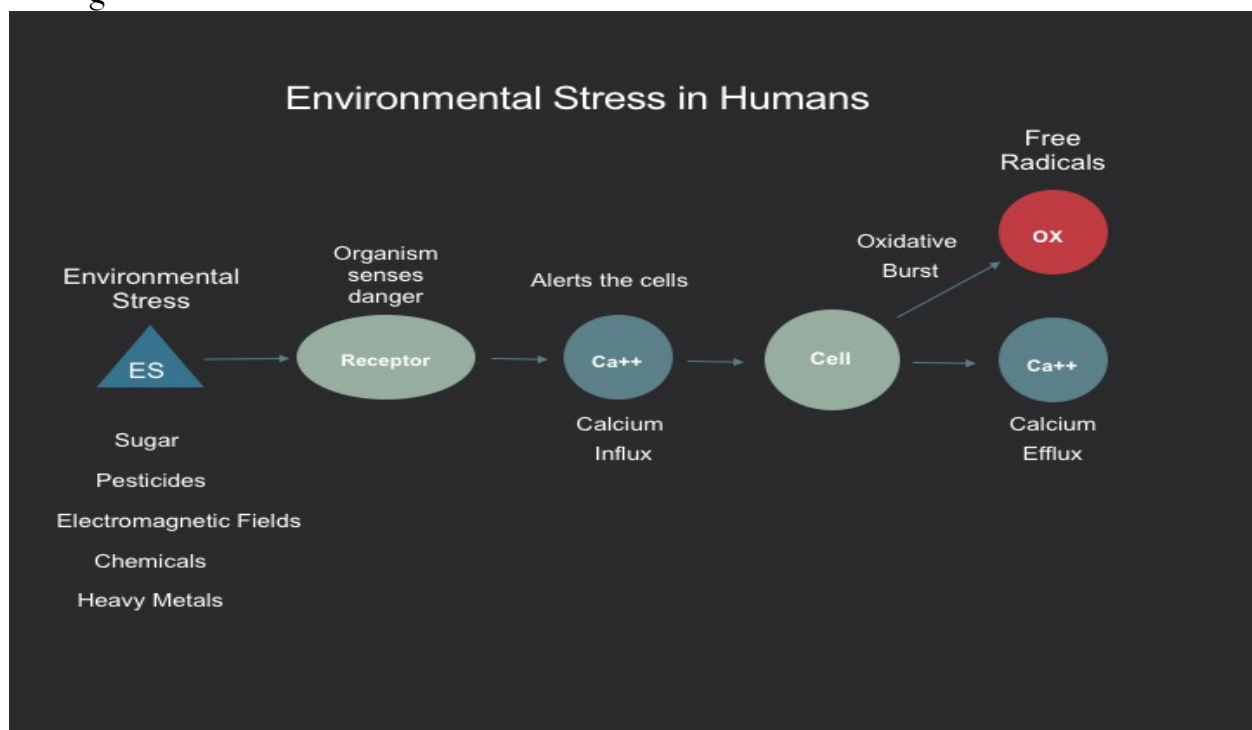
- **Sugar:**
  - Scientific consensus: triggers free Radicals and peroxynitrite
- **Round-up ready Crops**
  - Multiple studies: Glyphosate triggers free radicals and peroxynitrite
- **Electrical Energy**
  - 127 studies connect Wireless Radiation with free radicals
  - 24 studies connect EMFs to peroxynitrite production
  - 111 studies connect wireless to autonomic dysfunction (AD)
  - BioInitiative Report connects EMFs to chronic inflammation (CI)

Notice that nearly 150 studies link free radicals, peroxynitrite and inflammation with EMR. So, the underlying biochemistry of P-Factor is triggered by EMR and the 36 fastest-growing diseases in the US share all components of p-Factor.

The link between EMR and the sudden onset of the US Health Crisis is too overwhelming to dismiss out of hand. The mechanism is staring at us in plain sight. The correlation of the trends of new disease and highly explosive diseases and the exposure of the American public to EMR is substantial.

Just review the data: There has been a doubling 36 diseases since 1990 – during which the number of wireless devices and electronic devices has grown by more than 6085%. In a single generation 36 diseases have doubled, 20 have tripled, and 16 quadrupled. The annual economic cost to the US: \$2.7 trillion.

Below you'll see the chain of causation, which shows the innate response to an environmental threat. We link EMR: microwave radiation and EMI (dirty electricity) to chronic disease and rapid aging outcomes. These are our initial human-evolved steps to dealing with environmental threats.



In this graphic, the triangle represents a potential external trigger for free radicals and P-Factor. Microwave radiation (MW) and/or dirty electricity can trigger the natural stress response to an environmental toxin like EMR. This can set in motion the following:

- **Peroxynitrite (ONOO)** production— through the activation of dramatic changes in calcium ion levels caused by calcium ion voltage gates being triggered by EMR.<sup>11</sup>
- **Chronic Inflammation (CI)**, which is chronically triggered by immune system activation by EMR, which in turn, causes cytokines and histamines to be released.

This level of inflammation also triggers an oxidative response, which in turn, creates more inflammation.<sup>12</sup>

- **Free Radicals** (Oxidative Stress - OX) the natural environmental stress response entails the release of an oxidative burst at the cellular level. Studies show EMR creates damaging free-radicals (OX)

### **Solutions to the Dramatic Change in our Electrical Environment:**

Our electrical environment has changed dramatically since 1990. Wireless devices have grown dramatically. Devices plugged into our homes, offices and schools have proliferated, causing rising levels of dirty electricity. All this electrical energy is creating invisible stress in, and on our bodies, which leads to chronic disease and medical conditions.

### **Eliminating Dirty Electricity for Better Health and peak performance**

Dirty electricity can be mitigated by installing dirty electricity filters. As regulators, industry and health activists continue to battle over the veracity of health impacts from wireless and other EMR like dirty electricity, the rest of us can take action. We can dramatically lower the overall EMR load on our bodies and health by taking a few simple steps.

While the *abstract* scientific debate on EMR-induced health effects persists, thousands of individuals have already observed tangible changes in their own health by reducing the EMR in their living spaces. For instance, more than 500,000 dirty electricity filters have been sold in the US and testimonials from hundreds of people confirm profound changes in health, disease and stress symptoms after installing these filters.

For those who still remain skeptical about the connection between our electrical environment and health, attitude, frame of mind and energy levels, here's a simple experiment you can try for just one month:

- Use the [pScore form](#), or write down the date and a list of stress symptoms and health issues you currently face with a score of severity 10 is the highest. (this can include irritability, anxiety, sleep issues, memory lapses, mood changes, joint/ muscle pain, low sex drive, fatigue, headaches, etc.). Now add up your score and make a note.

- Filter the dirty electricity in your home, school or workplace. (most vendors have money-back guarantees)
- Put all wireless devices, including computers, on airplane mode while you sleep.
- Turn-off the Wi-Fi router while you sleep
- Move all electrical cords and devices away from your sleeping area. (at least 6 feet)
- Now one month later, enter a score for each health issue or stress symptom.  
Compare results.

Taking these inexpensive, or generally costless steps, can give our bodies time to recover from the biological stress created by the persistent electrical energy around us. It doesn't take any political position, whether pro or con on the current science, to test the connection. You can easily test the link for yourself.

Does decreasing the electrical energy in your living environment improve your health and well-being? The science (2300 studies cited in the US Navy study) suggests that as many as 132 stress symptoms and biological impacts may improve by removing or reducing electrical energy (see Appendix C) in your living environment.

Dirty Electricity is clearly becoming an increasing health concern in our homes, schools and work places. The question is how big a role it plays in the current US health crisis. The controversy persists. Fortunately, we now have tools to address the question pragmatically. Interventions like those described above can give us a glimpse into how electrical energy can play a part in health. While these interventions may not conclusively settle the debate, we can begin to learn about the important effects of the electrical environment around us, and how it enters into our state of health and wellness.

**Conflicts of Interest:** I am co-founder of Greenwave International, Inc., a Delaware Corporation. Greenwave designs, manufactures and sells products which help reduce EMR in our living spaces and exposures to electrical energy. Products include, iPhone and Android Ethernet adapters; and dirty electricity meters and filters.

## References and Appendices

### APPENDIX A:

#### Biological Impacts shared between EMR and Peroxynitrite:

- EMR/ Peroxynitrite triggers production of stress proteins.
- EMR/ Peroxynitrite interferes with cell signaling.
- EMR/ Peroxynitrite damages DNA
- EMR/ Peroxynitrite trigger Immune System to produce Inflammation.
- EMR/ Peroxynitrite raises stress hormone Cortisol
- EMR/ Peroxynitrite create Oxidative Stress (OX) (Free radicals)
- EMR/ Peroxynitrite trigger calcium ion imbalances (highly toxic for body)
- EMR/ Peroxynitrite increase permeability of blood brain barrier (BBB)
- EMR/ Peroxynitrite damage sperm and reduces Testosterone.
- EMR/ Peroxynitrite elevate blood sugar levels.

### APPENDIX B:

#### Possible Exogenous (external) Triggers for P-Factor

##### Diet

- **Sugar** in our diet increased by more than 1000% between 1970 and 1990. Dozens of studies confirm that sugar triggers peroxynitrite and thus P-Factor.
- **Roundup-ready corn, wheat and soybeans** are genetically-modified crops, which have been altered to be resistant to glyphosate, the active ingredient in popular weed-killer, Roundup. The growth of Roundup (glyphosate) in the US food supply rose by more than 3025% since 1990. Dr. Stephanie Seneff from MIT has shown a strong connection between glyphosate and the destruction of aromatic amino acids like tyrosine, phenylalanine and tryptophan. Each is a key biochemical target of

peroxynitrite. These amino acids are the building blocks for dopamine and serotonin. These two critical neurotransmitters are largely responsible for our outlook, mood, attitude, executive function, level of compassion and joie de vie.

- **Electromagnetic Radiation (EMR):** EMR from wireless and dirty electricity may trigger P-Factor through four separate Pathways:
  - **Peroxynitrite (ONOO)** – through the activation of dramatic changes in calcium ion levels caused by calcium ion voltage gates being triggered by EMR.<sup>11</sup>
  - **Chronic Inflammation (CI)**, which is chronically triggered by immune system activation by EMR, which in turn, causes cytokines and histamines to be released. This level of inflammation also triggers a oxidative response, which in turn, creates more inflammation.<sup>12</sup>
  - **Oxidative Stress (OX):** the natural environmental stress response entails the release of an oxidative burst at the cellular level. Studies show EMR creates damaging free-radicals (OX)<sup>(14,15)</sup> and **Nitrative Stress (NOX)**. Henry Lai surveyed 140 studies associating oxidative or nitrative stress with EMR. 123 out of 140 studies link cell phones, Wi-Fi and other EMR with increased oxidative stress (OX) and nitrative stress (NOX).
  - **Autonomic Dysfunction (AD):** EMR triggers the autonomic nervous system: It creates autonomic dysfunction (AD). 111 studies<sup>(13)</sup> show microwave/ radio frequency radiation trigger false signals within central nervous system (CNS), which can then speed up heart rate (heart palpitations), disturb sleep, deregulate body temperature, affect sex drive and more. More importantly electromagnetic signals from within the nervous system and the external environment experience a clearinghouse model mediated in the basal ganglia, which is located in the midbrain. Cells for transmission and reception act as hub for cell signaling via central nervous system and the peripheral nervous system. These signals operate between 500 MHz and 25 GHz, which covers 95% of all wireless bandwidth. Thus, it is apparent that the disruptions to the autonomic nervous system is mediated through the basal ganglia. The autonomic nervous system also importantly



participates in triggering oxidative bursts at the cellular level. These bursts are part of the natural environmental defense system. In plants and animals oxidative bursts are triggered by an influx of calcium. An oxidative burst into the cell is soon followed (2-48 hours) by a much sharper efflux of calcium. This high level of extracellular calcium creates toxicity and up regulates nitric oxide, a precursor of peroxynitrite.

## APPENDIX C

Following is a sampling of biological impacts from wireless signals (microwaves), which are identified across 2308 studies, compiled by the US NAVY in a survey of the global science: "Reported Biological Phenomena (Effects) and Clinical Manifestations attributed to Microwave and Radio-Frequency Radiation <sup>(5)</sup>:"

- **Central Nervous System Effects (9)**
  - Headaches
  - Insomnia
  - Cranial nerve disorders
  - Vagomimetic action of the Heart; sympatico-mimetic action
- **Autonomic Nervous System Effects (4)**
  - Alteration of the heart rhythm
  - Fatigue
  - Structural alteration of the synapses of the vagus nerve
  - Stimulation of the parasympathetic nervous system (Bradycardia)
- **Genetic and Chromosomal Changes (5)**
  - Chromosome aberrations
  - Mutations
  - Mongolism
  - Tumors (cancer)
  - Cellular changes (somatic alterations)
- **Psychological Disorders (17)**
  - Depression
  - Impotence

- Anxiety
- Lack of concentration
- Dizziness
- Sleepiness
- Insomnia
- Increased irritability
- Memory loss
- Chest pain
  
- **Vascular Disorders (2)**
  - Thrombosis
  - Hypertension (high blood pressure)
  
- **Blood Disorders (14)**
  - Blood and bone marrow
  - Blood glucose concentration (increase)
  - Blood Histamine content (inflammatory marker)
  - Cholesterol and lipids
  - Albumin/ globulin ration (decrease)
- **Enzyme and other biochemical changes (13)**
  - Alteration in cell division
  - Change in concentration of Glycogen in Liver
  - Tissue cultures killed
- **Metabolic Disorders (4)**
  - Gastro-intestinal disorders (4)
  - Anorexia
  - Constipation
  - Epigastric pain
  - Altered secretion of stomach (digestive juices)
- **Endocrine Gland Changes (8)**
  - Altered pituitary function
  - Hyperthyroidism
  - Thyroid enlargement

- Altered adrenal cortex activity
- Decreased corticosteroids in blood
- Hypogonadism (decreased testosterone production) – low T
- **Changes in physiological Function (29)**
  - Decreased fertility
  - Altered sex ratio of births (more females)
  - Altered blood flow
  - Altered menstrual activity
  - Structural changes in cerebral cortex
  - Myocardial necrosis
  - Dehydration
  - Alteration of diameter of blood vessels
  - Liver enlargement
  - Alteration in sensitivity to light, sound and olfactory stimuli
  - Altered rate of calcification (osteoporosis)
- **Miscellaneous Effects (10)**
  - Metallic taste in mouth
  - Loss of hair
  - Sensations of buzzing, vibrations, pulsations, tickling about head and ears
  - Copious perspiration, salivation
  - Changes in circadian rhythms

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