

The Adverse Health Effects of EMFs from Modern Technology

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Introduction

Today we face a threat to our health that did not exist just over 100 years ago. Our modern technology has created a new form of pollution which we can't see, taste, or smell and its invisible nature has most unaware of its ever-increasing presence in both our personal and public environments. Since seeing is often a prerequisite to believing, we have relied on the most recent research to provide insight into how our technology is influencing our biology. Unfortunately, this research is not preceding the introduction of new technology, but rather comes much later as the concerns of the public mount while the government and technology companies continue to assert that all this unnatural, man-made radiation is 'safe'. With the now conclusive evidence of negative health effects from unnatural EMFs, it has become paramount that we learn not only what type and how much of this harmful radiation we are being exposed to, but also the best and most effective measures to protect ourselves and our families. If we, and especially our children, are to stay healthy and be able to heal from illness in the midst of this ever-increasing radiation exposure, then we need to take action now to prevent what will become the health epidemic of the 21st century.

It is the goal of this article to offer a thorough presentation of the current information on EMF health effects, safety standards, and protection solutions. We will also take a look at the natural beneficial energies of our planet and its role in our health and well-being. From here we will examine the unnatural sources of radiation from modern technology, the current accepted safety standards, known health effects from the scientific literature, and why we are affected by all this man-made radiation. We will then bring this discussion full circle with the most effective, yet simple, protection solutions to help us stay balanced and healthy as nature intended. It is my sincere hope that as this information becomes widely known to the public we will demand better safety standards and testing to prove the biological safety of new technology before it is unleashed on an unsuspecting public.

Our Natural Electromagnetic Environment

It is a simple truth of life that all living things are connected to one another. While modern Man likes to think Himself separate from the environment and nature and not dependent upon it, the reality is, as John Donne penned, 'no man is an island'. Our belief that we are separate from nature couldn't be further from the truth. We are, in fact, an extension of nature and the creative living forces which shape the natural world we live in. Human beings, as one part of a dynamic living system, are interconnected with all other life on the planet and indeed with the planet itself. A powerful illustration of our connection with nature can be found in our dependence on the Earth's natural electromagnetic environment. Not only is our physical and mental health dependent upon the natural frequencies of the Earth, it is part of the foundation upon which **all life** has evolved over the millennia. And while we may not consciously recognize its role in our health and well-being, we are most assuredly suffering from our interference with the natural energies of the Earth in a profound way. To understand why this is, let us begin with a look at what our natural electromagnetic environment is and how we interact with it.

The electromagnetic energies of our planet come from both the Earth's surface (land and oceans) and the atmosphere as they conduct electricity. The electric current of the Earth is generated mainly by thousands of thunderstorms and lightning strikes that occur continuously around the world. This creates a current from the ionosphere (layer of atmosphere) to the ground and is known as the 'global electrical circuit' [1]. Because of this current, the surface of the Earth is negatively charged relative to the ionosphere and carries with it an abundance of free electrons. Therefore, the surface of the Earth is a natural source of electromagnetic energy (field).

The natural energy (electromagnetic) field of the Earth is responsible for the proper function of many processes of the body as it provides the reference point for biological cycles (this will be discussed in detail later). In order for the Earth's energy field to benefit us, we must be in **direct contact with the Earth**, or in other words, 'grounded'. In this natural state the body receives the crucial energy needed to aid numerous biological processes such as sleep cycles, hormone production, digestion, and immune response. Essentially what this means is that the body needs a direct physical connection with the ground in order to maintain its inherent health and balance. Anything which causes a disconnection from this natural condition will lead to various imbalances and eventually dysfunction and disease.

Having a direct connection with the surface of the Earth has been the natural state of humans for millions of years. People have walked, lived, and slept directly on the ground with only natural materials such as leather, cotton, and wood to provide footwear, clothing, and shelter for most of human history. Even with the Industrial Revolution and the advent of the alternating current (AC) of electricity, people were still essentially connected to the ground through their use of natural materials which

allowed their bodies to discharge any excess electricity into the ground and receive the beneficial free electrons of the Earth. It was only about 50 years ago with the invention of synthetic materials such as plastic that our direct connection with the Earth became severed. Nearly everyone today wears synthetic rubber-soled shoes which insulate us from the ground we walk on. Also too, many of us today live and work one or more floors above the ground surrounded by synthetic materials and unnatural EMFs, especially when sleeping. The results of this are profound and research (see EMF Protection Solutions) has shown we are suffering the consequences of separation from our natural connection with the Earth.

One of the other most important aspects of our natural electromagnetic environment is the Schumann Resonance. These are low amplitude, low frequency electromagnetic waves generated in the ionosphere by lightning strikes. The most important of these various frequencies is the Schumann fundamental frequency of 7.83 Hz. Human and animal brains will preferentially lock onto this fundamental frequency and use it to synchronize biological rhythms, such as sleep cycles and hormone production. In addition, the 7.83 Hz frequency has shown coherence in various parts of the brain and is needed for orienting attention, memory processing, motivation, coordination, and to give a sense of well-being [2]. To illustrate just how important the Schumann waves are to our well-being, we need only to look at manned space flight. When the first astronauts in the 1960's returned from their missions, many developed severe health conditions. It was determined that the lack of the Earth's geomagnetic field, and in particular, Schumann waves were to blame. Since this time NASA now builds Schumann wave generators into manned space craft in order to keep the astronauts physically and mentally healthy. Furthermore, research has shown that exposure to the Schumann fundamental frequency will lower blood pressure [3] and in a Chronic Fatigue Syndrome study, there was increased overall well-being, decreased pain, fatigue, brain fog, and allergies in the majority of participants [2].

It has been in this natural electromagnetic environment in which **all** life on Earth has developed for billions of years. It has only been in a mere fraction of that time, approximately 100 years, in which all living things have been exposed to man-made, unnatural radiation from our modern technology. Starting with the advent of electricity to our current use of wireless technology, our electromagnetic environment has changed dramatically. Today we no longer just interact with the rhythmical oscillations of nature, but instead we drown out these frequencies with the 'electro-pollution' of modern living and cut ourselves off from our natural direct connection with the Earth. In particular, the pollution of our environment with unnatural, pulsed microwave / radiofrequency radiation has been exponential over the past few decades. And the trends indicate that as technology progresses, so too will our exposure to ever-increasing levels of this unnatural, harmful radiation. While the growth in this technology has given us greater freedom in communication and made our lives easier, scientists from around the world are conclusively proving that we are now reaping the health consequences of our new, biologically untested technology. It is the evidence

from these scientists that will hopefully, at long last, no longer allow the government, health and regulatory agencies, telecommunications companies, and broadcasters to turn a blind eye to the harmful effects of all this 'safe' radiation. The health epidemic that looms before us if we do not reduce our exposure and protect ourselves and our families is real indeed and much sooner than many wish to believe.

So Where Does All This Unnatural Radiation Come From?

Sources of Electro-Pollution:

Electrical Equipment and Wiring

- Appliances: Alarm Clocks, Hair Dryer, Vacuum, TVs, Lamps, Stereos, etc.
- Home Wiring (50/60 Hz)
- Equipment: Computers, Printers, Fax Machines, Copiers, Industrial Equipment (welding, instrumentation, etc.)
- External Electrical Power Lines, Sub-Stations, High-Voltage Cables, etc

Microwave / Radiofrequency Technology

This includes all Wireless and Digital Technology

- Digital TV Broadcasts: 200MHz – 860MHz
- Cell Phones (2G): 800MHz – 1.8GHz
- Cordless Phones: 900MHz, 2.45GHz, 5.8GHz
- DECT (Digital Cordless Phone): 1.9GHz
- Cell Phones (3G): 2.2GHz – 3.0GHz
- Wi-Fi, Wi-MAX, Wi-LAN: 2.45GHz – 2.50GHz
- Microwave Ovens: 915MHz – 2.45GHz
- Radar (military, airports, etc.)

- CFL Bulbs: These emit RF / Microwave Radiation due to a tiny transformer that is used to excite the gas inside the tube which produces light [4]. Add this to the UV Radiation and Mercury Vapor from these 'green' bulbs and you have a recipe for a health disaster!!
- All other wireless devices such as Baby Monitors, Home Alarm Systems, Gaming Systems (i.e. Wii), Smart Meters, etc.

Metallic Objects

These objects do not emit EMFs on their own, but rather act as antennae which will collect and then radiate unnatural energies.

- Water Pipes, Gas Pipes
- Electrical Circuits, Telephone Lines
- Keys, Rings, Watches, Jewelry, Metal Piercings (ear, navel, tongue, etc.)
- Metal Fillings: EMFs near fillings cause mercury vapor to leak which is then inhaled through the mouth to the lungs and eventually makes its way to the brain [4].
- Springs in Mattresses
- Bras (metal wire in underwire bras)

This invisible radiation, as shown by the above list, is everywhere – home, office, school, coffee-shop, hospital, highways – even the countryside is littered with cell towers! It is easy to understand how we are being exposed to **100 – 200 million**, and in some metropolitan areas, **1 billion times more** unnatural radiation than those who lived only 100 years ago were!

Safety Standards and Health Hazards

ELF-EMF From Electric Power

Safety Standards

Electric power generates two types of fields: an **electric field** which is dependent on the voltage and is always present when the power is switched on and a **magnetic field** which is generated by electric current flowing in the line when appliances, machinery and the like are in use. This means that an electric field is always present in powerlines, home wiring, and any appliance which is plugged in (but not in use). Likewise, a magnetic field only occurs when electric power is in use in powerlines, home wiring, appliances, and machines and therefore can vary considerably depending on demand (load current). Electric fields are blocked by most building materials but magnetic fields will pass through these materials unhindered. Magnetic fields are reduced mainly by increasing distance from the source. Therefore, exposure limits for electrical power frequencies should include both electric and magnetic fields.

In the U.S. there are **no federal standards** for limiting exposure to electric and magnetic fields in the ELF (Electrical Low Frequency) range of 3 Hz to 3,000 Hz (3 kHz). This range encompasses all transmission powerlines, sub-stations, home wiring, electrical appliances, and industrial machinery / equipment. What this means is that no federal agency has **required** safety regulations to limit exposure to ELF-EMFs in either occupational or residential settings.

While a number of U.S. agencies such as OSHA (Occupational Safety and Health Administration), EPA (Environmental Protection Agency), DOE (Department of Energy), NIEHS (National Institute of Environmental Health Services), and NCRP (U.S. National Council on Radiation Protection) have issued statements and reports regarding ELF-EMF, there has been no adoption of exposure limits on a national level. Instead, most U.S. agencies defer to the ICNIRP (International Commission on Non-Ionizing Radiation Protection) 1998 Guidelines as a voluntary standard for safety limits. Unfortunately, the ICNIRP has a heavy industry bias within the organization and its conclusion that there is only 'weak evidence' regarding the negative health effects of ELF-EMF has been repeatedly and consistently challenged by the large body of research demonstrating a positive correlation (see Health Hazards of Electricity below).

In addition, the ICNIRP exposure limits, which are called 'basic restrictions', only protect from induced muscle spasm and 'seeing stars', i.e. **extreme effects** on the central nervous system. Therefore, these limits **do not** take into account biological damage that occurs at lower field strength levels or for chronic / long-term exposure. Also too, the power-frequency guidelines are written in quantities that are difficult to measure

and therefore difficult to enforce. This requires a mathematical 'translation' into a quantity that can be measured and a 'reference level' set [5]. Obviously, this system has not been set up for making compliance and safety a top priority. Let's take a look at what the ICNIRP recommends as 'safe exposure limits':

	<u>Electric Field (V/m)</u>	<u>Magnetic Field (mG)</u>
ICNIRP 1998 (50/60 Hz)	10,000 V/m (Work)	5,000 mG (Work)
	5,000 V/m (Home)	1,000 mG (Home)

What we need to bear in mind here is that few people will ever be in magnetic fields over 1,000 mG, except for those in an industrial setting, and these levels still may never reach beyond 3,000 mG [5]. Again, this reveals that the 'safety limits' are set for 'extreme' conditions and not 'real life' conditions, thus giving people a false sense of protection since they are routinely exposed to much lower field strengths.

So what are other countries and organizations recommending?

While most of Europe follows the ICNIRP 1998 Guidelines, Sweden has taken a much more stringent stand on ELF-EMF exposure. Based on research which showed that constant exposure to magnetic fields of only 2 mG to 4 mG caused an increase in leukemia, the Swedish Confederation of Professional Employees (TCO) recommends exposure limits of **2 mG** (magnetic field) and **10 V/m** (electric field). That is **500-times less** radiation exposure than the ICNIRP guidelines allow as 'safe' and is based on scientific evidence of a positive correlation between leukemia and ELF-EMFs (see Health Hazards of Electricity below).

Although the U.S. follows the ICNIRP 1998 Guidelines, in 1995 the NCRP (U.S. National Council on Radiation Protection) issued its own recommendations for ELF-EMF exposure. Based on the evidence, they recommended a graduated plan for reducing ELF exposure over the course of ten years to reach the **2 mG and 10 V/m** levels [6]. At this time, these recommendations have not been implemented and governmental agencies along with power companies continue to assert that there is 'weak evidence' to support these stricter guidelines.

The U.K. EMF safety organization Powerwatch has recommended the following limits for residential exposure to ELF-EMFs (based on studies indicating health effects above 2.0 mG):

	<u>Electric Field (V/m)</u>	<u>Magnetic Field (mG)</u>
Living Areas:	< 15 V/m	< 1.5 mG
Bedrooms:	< 10 V/m	< 1.0 mG
Other Areas of Home:	< 15 V/m	< 2.0 mG

While there are a number of factors which influence magnetic field exposure levels such as distance from source, load current, and duration of exposure, people are still being exposed daily and sometimes for long periods of time to unsafe levels of ELF-EMFs as determined by numerous studies (see Health Hazards of Electricity below).

Common sources of high magnetic fields that people encounter on a daily basis include **alarm clocks, hair dryers, vacuum cleaners, electric ovens, photocopiers, computers and power lines.**

The only way to know exactly what your exposure levels are (at both home and work) is to use a meter that will measure both electric and magnetic fields. For information on how to reduce your exposure to ELF-EMF please see the Protection Solutions section.

Health Hazards

Research into the health effects of electric power has been mainly focused on the magnetic fields generated by both high-voltage power lines and the general electricity supply. Studies conducted in both Europe and the U.S. have found a positive correlation between exposure to ELF magnetic fields and childhood leukemia [7,8,9,10,11], adult leukemia [12, 13], neurodegenerative diseases (such as ALS, Alzheimer's) [10,14,15,16], miscarriage [17, 18], and clinical depression.

It has been the link with childhood leukemia though that has been the most widely studied. In particular, it has been shown that exposure to magnetic fields greater than 3 – 4 mG double childhood leukemia rates [7, 8, 10]. While the research to date can not conclusively prove a causal relationship between power-frequency EMFs and leukemia, there is however substantial support for these EMFs to affect the body's

ability to repair damaged cells and alter other crucial immune processes. It is also very likely that other environmental factors, such as chemical exposures, play a role in the etiology of a disease such as leukemia. In fact, several studies have shown that ELF-EMFs can actually attract aerosol pollutants [19,20,21] which provides another possible way in which these various environmental exposures combine to induce malignant cellular changes.

An additional area of research has focused on the effects of poor power quality or what some have called 'dirty electricity'. This is radiation, usually at the low end of the RF range (kHz), which flows along and radiates from wiring and deviates from a 'pure' 60 Hz frequency. It is generated by electronic equipment such as computers, plasma televisions, energy efficient appliances, dimmer switches as well as by electrical conductors caused by loose wires or contact with trees. It is thus produced within buildings and can also enter buildings from neighbors who share the same transformer. Research has shown that when this 'dirty electricity' is reduced through the use of filters symptoms of Diabetes and Multiple Sclerosis are greatly improved [22].

It is also interesting to note that organizations in both Europe and the U.S. publicly claim in their summary of findings that there is a 'lack of evidence' to support stricter guidelines on power-frequency limits. However, in their full reports (that the public typically doesn't read) they often make acknowledgements to the contrary. A most glaring example of this is the 1999 NIEHS EMF-RAPID study which concluded that there was 'weak evidence' to support a link between ELF-EMF and leukemia or other health conditions. This report is often referred to when rejecting questions regarding stricter safety limits in the U.S. and interestingly, this study was **50% funded by the electric power industry** with the rest from the federal government. In this very same report in the conclusions section, it is acknowledged though that ELF-EMF should be listed as a **'possible human carcinogen'** based on the evidence of an increase in risk for childhood leukemia (residential exposure) and adult leukemia (occupational exposure) [23]. In addition, the IARC (International Agency for Research on Cancer), a division of the WHO (World Health Organization), in its 2002 report also stated that ELF-EMF should be considered a 'possible human carcinogen' [24].

While the exact mechanism(s) for how ELF magnetic fields cause biological damage is still debated, several theories have been put forth based on the current research which include:

- 1.) **A suppression of the anti-cancer hormone melatonin.** Melatonin is produced at night by the pineal gland which is very sensitive to electromagnetic pulses. The body does its repair and healing work at night and when one of the body's repair molecules, melatonin, is suppressed at this crucial time, efficient restoration of damaged cells and their DNA does not occur [25].

2.) **Free radical generation** induced by ELF magnetic fields [26].

3.) **Change in charge distribution across cell membranes** that affect membrane transport proteins (including ion channels) and protein synthesis [27].

It is likely that one or more of these mechanisms (or other undiscovered ones) are at play in the development of the health effects associated with ELF-EMF.

RF-EMF from Wireless / Digital Technology

Safety Standards

Just like electric power, radiofrequency / microwave radiation has both an electric and magnetic field component. The electric field is measured in 'volts per meter' (V/m) and the magnetic field is measured in 'amperes per meter' (A/m). In addition, RF radiation is also measured in terms of power density and specific absorption rate (SAR). The most useful and relevant microwave measurements for all practical purposes are SAR and the 'volts per meter' quantities. It is beyond the scope of this discussion to differentiate amongst the measurements and their uses as this is a rather complex topic and is not necessary for gaining insight into our current safety standards.

In the U.S., the FCC (Federal Communications Commission) licenses and therefore regulates most RF devices, services, and facilities used by the public, industry, and state and local government organizations. While the federal government itself has not set official RF safety standards, the FCC, in its regulatory capacity, has done so based on the recommendations of several 'expert' organizations (American National Standards Institute - ANSI, Institute of Electronics and Electrical Engineers - IEEE, NCRP). At first glance this would appear to be acceptable, except for the fact that these organizations base their limits solely on one aspect of RF / Microwave radiation: **thermal effects**.

Thermal or heating effects are the damage done to the body by heating that occurs at levels above the maximum of exposure to microwave radiation. So in effect, the 'safety' levels are only there to ensure that you don't cook your skin or internal organs from the heat that microwaves generate. So what, you may ask, is wrong with this criterion? The problem with relying solely on 'thermal effects' for safety standards is that it dismisses the notion that non-thermal or biological effects can occur at very low field strength levels than those needed to heat the body and its tissues. While these 'expert' technical organizations and the telecommunications industry deny the existence of 'non-thermal' or 'biological' effects, the mounting, and now conclusive body of research (see Health Hazards of RF / Microwave Radiation below), **proves that non-thermal, biological effects of RF /microwave radiation do exist and are a health hazard!**

As it currently stands, the U.S. guidelines are based on the FCC's 1996 adoption of the recommendations put forth by the NCRP, ANSI, and IEEE [28]. Just to put this into perspective – these regulations were adopted **before** the introduction of Wi-Fi and the explosion of cell phones and therefore cell phone towers / masts. Also to note is the fact that even in the face of the enormous increase in RF / microwave technology the FCC rejected a 2003 petition by the EMR Network to re-evaluate the safety standards. The FCC claimed, among other things, a lack of expertise of on their part and threw responsibility to other 'more germane agencies' such as the FDA, EPA and IEEE [29]. As these groups, and in particular the IEEE, have an industry bias, it is unlikely that the telecommunications industry will police itself and impose stricter guidelines on RF technology. In fact, the FCC OET Bulletin 56 (Aug. 1999) acknowledges the assistance of employees of both Motorola and Lucent Technologies in 'reviewing' the document. These companies have an obvious vested interest in allowing the most lenient of standards and denying the existence of non-thermal effects. So while there has been a massive proliferation of RF / microwave technology and therefore a tremendous increase in unnatural microwave radiation over the past decade, **our 'safety standards' are over 13 years old and deny the existence of proven non-thermal biological effects!**

One of the most important FCC standards is the measurement called **Specific Absorption Rate (SAR)**. SAR is a measure of the rate at which the body absorbs RF energy. The SAR level is most commonly used to describe the radiation absorbed close to the body (i.e. head) with respect to cell phone usage. This is also known as a 'partial-body' or 'localized' exposure. SAR is also used to determine 'whole-body' exposure and reflects more the exposure to Wi-Fi and Cell Phone Towers / Masts.

1996 FCC RF Exposure Limits
(100 kHz – 6 GHz)

SAR for General Public

Whole Body < 0.08 W/kg

Partial Body ≤ 1.6 W/kg

The partial-body SAR measurement is very important, especially for cell phone users. Every cell phone manufacturer lists its SAR for each of the models of phones that they make. To find your cell phone model go to www.cnet.com or check your cell phone manual. Not all phones have the same SAR and some are definitely better than others. Currently (as of December 2009) the phone with the lowest SAR is the Beyond E-Tech

Duet D8 at 0.109 with the LG KG800 Chocolate at 0.14 and Blackberry 6280 at 0.24 not far behind. The phone with one of the highest SAR levels is the Motorola RAZR V3a at 1.59. You will notice that both of these high and low phones have a SAR less than 1.6 W/kg to meet the 'safety standards'. But remember, these standards only protect from 'thermal / heating effects', **not** the 'non-thermal', biological effects. **The latest research from Austria show that non-thermal, biological damage occurs at SAR levels of only 0.1 W/kg** [30]. With this in mind, it would be best to use a cell phone with a lower SAR along with other prudent safety measures (see Protection Solutions).

In order to determine where the 'hot spots' are in your home or office from RF radiation, due to Wi-Fi, Cell Towers, TV transmitter towers, airport radar and the like, requires a meter. According to the U.K. EMF safety organization Powerwatch, it is recommended that living areas such as **bedrooms not read above 0.05 V/m from RF radiation**. Many factors can influence RF readings, therefore various measurements need to be taken at several different times of the day to find the average and peak levels of radiation.

For information on how to reduce your exposure to RF-EMF please see the Protection Solutions section.

Health Hazards

While many sources of man-made electromagnetic radiation have been shown to contribute to ill-health, it is the now saturation of both our personal and public environment with RF / microwave radiation which is the most dangerous EMF threat to our health. Although not widely known, it is a fact that wireless technology, especially the ubiquitous Wi-Fi, was **never tested** before being introduced to the public in 1997. Wi-Fi escaped testing due to its use of an unlicensed part of the radio spectrum and so long as basic requirements for interference and compatibility were met, consumers were free to buy these Wi-Fi devices [31]. So too is the case with our full switchover to Digital TV broadcasts. No testing has been done to determine the safety of this new TV broadcast format even though the new signal is 250 times stronger than the previous analog one. In fact, several German physicians wrote to President Obama and Congress urging caution and requesting a stop to the introduction of DTV based on the negative health effects experienced in Germany [32]. The same case can be made for Cell Phones and Cell Towers / Masts. As it stands, in the 1996 Telecommunications Act, no state or local government can regulate where cell towers are placed based on the 'environmental effects' (i.e. human effects) of RF radiation as long as said towers comply with FCC 'safety guidelines' [28]. So while the government and industry deny 'non-thermal' effects, towers can be placed on school buildings, in parks, in neighborhoods – anywhere the telecommunications industry wants without regard for long-term health effects since no testing was ever performed to ensure its safety. The

practice of 'passing the buck' and relying on outdated guidelines must come to an end to ensure the safety and well-being of everyone, not just for us currently but for generations to come.

In order to fully appreciate how this unnatural radiation damages our health and well-being – physically, mentally, and emotionally – we need to first understand the basic principles upon which wireless and digital technology works. From this foundation we will explore what scientists in the field of biophysics are demonstrating and proving in regards to how and why we interact with EMFs. It is the results from this research which provide proof that man-made microwave radiation is a legitimate and serious threat now with the potential to become the next health epidemic if we continue on our current course.

The most fundamental aspect of understanding the danger of wireless / digital technology lies in the type of signal used. Prior to the use of digital technology all radio wave signals were broadcast in analog format. An **analog signal**, in its most basic definition, is an **unmodulated radio wave**. What this means is that the signal moves along through the air in a 'sine wave' (See Figure 1 below). Notice how the wave moves up and down in a continuous, rhythmical fashion. This is how energies in nature flow. Since normal radio waves move in this flowing manner, they are not dangerous to us (only exception is the heating effect to the body when standing too close to a transmitter tower). This is, in very basic terms, how radio stations, the previous analog TV, and some older cordless phones work.

In contrast to the analog signal, a **digital signal** is a **modulated radio wave**. What this means is that instead of the smooth rhythm of the sine wave, we now have the unnatural, man-made 'square wave' (See Figure 2 below). This angular wave represents a **pulsed signal** which is either on (1) or off (0). This is exactly how Cell Phones, Digital TV broadcasts, Wi-Fi, Bluetooth, Cell Towers / Masts, and all other wireless technologies work. In order for all these technologies to carry the necessary information the signals must be modulated. Therefore, **the key to wireless and digital technology is a pulsed or modulated radio wave which emits unnatural microwave radiation**. It is with this unnatural pulse modulation of microwave radiation that lies the greatest threat to our health.

Figure 1

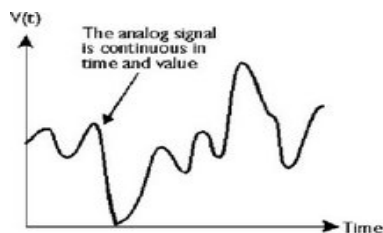
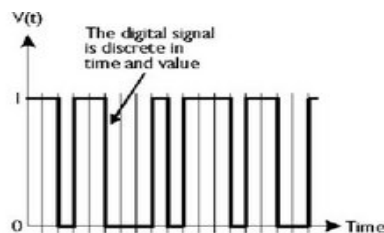


Figure 2



Let's take a closer look at these digital signals. There are two aspects to digital signals – the high frequency of the broadcast microwave (carrier wave) and the low frequency of the pulse modulation (data transmission). In other words, the data transmission is embedded in the carrier wave. The carrier wave is usually high frequency and low power. The modulated portion (data transmission) is low frequency but very high power. These signals are amplitude modulated and the signal strength rises and falls in time at a lower frequency [33]. It is these very sharp spikes (peaks) of high amplitude (high power) unnatural pulsed lower frequencies, many of which occur in the biologically active range of 3 – 25 Hz, which can and will interfere with everything from brain processes to hormone production to cell repair. Even though these signals are many magnitudes lower in power than guidelines established by the FCC in the U.S. or by the ICNIRP for Europe – which again only protect from thermal / heating effects – the body is negatively affected due to non-thermal biological effects.

While many, especially the telecommunications industry, regulatory agencies (FCC), and radiation safety organizations (i.e. ICNIRP) still claim there is no proof of these non-thermal effects, research has provided **conclusive evidence** of non-thermal biological damage. These scientists have proven that when we are exposed to the unnatural, man-made radiation from our modern technology it will have a **direct negative effect** on our nervous system, immune system, cellular function, and ultimately our DNA [30]. The AUYA Report of July 2009 verified that EMFs from cell phones damage the brain and nervous system, immune system, and induced changes in protein synthesis which led to increased rates of DNA breakage, all at power levels well below the accepted SAR levels. **In fact, damage was shown to start at 0.1 W/kg.** Remember, the U.S. safety guidelines for cell phones are ≤ 1.6 W/kg! Also noted in this report was the **increased susceptibility of children and youths** to the negative health effects of this radiation due to the especially pronounced tissue growth and therefore cell replication of this age group.

There have been several proposed mechanisms by which wireless and digital technology induces biological damage. These include:

1. **Cell Demodulation of Digital Signals:** This is a process in which the body collects the signal and turns it into electric currents which are carried by ions in the tissues and blood vessels. When the currents contact the cell membrane it tries to vibrate in time with the current. The cell then demodulates the signal so that the low frequency component is extracted and appears across the membrane where it can do the most damage. At this point significant vibration occurs on a molecular scale, and in particular, positively and negatively charged ions are driven in the opposite of their natural direction. As a result, the cell membrane destabilizes due to preferentially losing double positive charge calcium ions and thus causes leakage of the cell membrane. This in turn will produce many of the biological effects of exposure to man-made microwave radiation [33].

2. **Interaction with Protein Receptors:** There is evidence that the slower frequencies of digital signals will interact with protein receptors on the cell membrane and cause vibrations which can close down the cell membrane. In this mechanism, nutrient flow is impaired and waste products cannot make it out of the cell. It also disrupts inter-cellular communication so that cell clusters no longer work together effectively. With the increase in waste products **free radicals** are generated along with messenger RNA which passes on this 'learned response' to daughter cells so that these new cells respond to microwaves in the same way [31].

3. **Weakened O-H Bonds of Proteins:** According to the scientists in the AUYA Report, it is proposed that vibrations within the oxygen-hydrogen bonds responsible for stabilizing three dimensional protein structures cause a weakening of these bonds. This leads to a temporary denaturation of the proteins and the observed increase and change in compensating protein synthesis rates [30].

What this research has shown is the how behind the health effects of wireless and digital technology. What remains left unanswered is the why – why do we experience this damage and more importantly, does this affect all of us or only some sensitive individuals? To answer this all important question we need to examine the biophysical nature of the human body.

In the simplest of terms the human body, as living substance, is both **energy** (biophysical) and **matter** (biochemical). Many today are unaware of this fact and much of the reason for this is the mechanistic and reductionist view of modern science and medicine. In particular, modern medicine has concerned itself primarily with the biochemical aspect of human physiology as seen by the overwhelming use of synthetic chemicals (drugs) to alter 'isolated' biochemical pathways and surgical procedures to remove or replace malfunctioning parts. In essence, this philosophy views the human body as no more than a machine in which any process or organ can be independently manipulated without regard for any other system in the body. Do we not see this in the myriad of medical specialties and physicians today? Each has their field of expertise in how to treat one area, but there is a lack of understanding of the interconnectedness of all body systems, including the emotions and mind. We have been taught to believe that isolating a chemical or structure of the body is the 'scientific' approach to addressing health and disease. With this 'scientific' mentality, scientists and physicians keep looking for the key that will solve the riddle of illness. First it was the microbe (or germ) that was the cause of all disease and with the discovery of penicillin and sulfa

drugs it was thought illness could be eradicated. When this approach failed we turned to genes. The 'holy grail' of medicine now lies in the search for the genes which are responsible for disease. This again has turned out to be a false promise as nearly all chronic health problems are not caused by 'bad genes'.

What our 'scientific' isolated system has missed is that the body is more than just a sum of its parts. We are more than just biochemicals which can be altered to affect a change – which is not without complication as can be seen by the list of side effects and contraindications for any medication / drug used today. We are also a dynamic energy system. We are connected to and interact with our environment – for better or worse. So while we continue to search for the isolated genes which cause disease, we cannot see the most crucial piece of the puzzle right before us – our biophysical (energetic) nature.

When we look beyond our medical system we see that there are other (and some much older) schools of thought which view health and disease quite differently. For example, Traditional Chinese Medicine and Homeopathy are based upon the understanding that the biophysical aspect informs and directs the biochemical aspect of human physiology [47]. Both of these medical sciences, while not accepted by modern medicine as 'scientific', have been proven valid by the science of biophysics. What these disciplines have known is that the body's energy field is the most fundamental aspect for maintaining physical, mental, and emotional health. It is modern medicine that has it wrong and we are the recipients of this 'inversion of truth' health care paradigm.

If modern medicine has indeed taken the wrong path with its mechanistic and biochemically-limited view, then we should be able to find evidence of the importance our biophysical / energetic nature. We can see this quite simply in how the nervous system and muscles work. Neurons in the brain and nervous system relay information by means of electrical signals. Our muscles contract and relax due to electrical impulses. Medical tests such as the EEG and EKG (ECG) measure the electrical activity of the brain and heart respectively. Devices such as a defibrillator use electricity (direct current) to restore the heart's natural rhythm and a special DC generator can heal a bone fracture. We also have electrolytes (electrically charged ions) which are abundant within both the intra- and extra-cellular fluids of our body. These electrolytes play a crucial role in numerous biological processes, including proper cell membrane function. In addition, biological rhythms such as sleep cycles and hormone production are synchronized based on the electromagnetic field of the Earth to our pineal and hypothalamus glands and to the hippocampus of our brain.

But it is the finding of biophysicists which reveal the truly fundamental role of energy in human physiology. It is now known that our DNA has the ability to store and emit light (biophotons) [34]. This turns the purely biochemical understanding of DNA on its head and revolutionizes our concept of how DNA actually works. Instead of the purely static and inert biochemical structure of Watson and Crick, **DNA is "...rich in movement.**

It vibrates, 'breathes', and emits" [34]. The light energy that DNA emits is **coherent**, meaning that on the quantum / subatomic level, there is order, cooperation, and balance. It is from these coherent light / biophoton emissions of many different frequencies that the directions to carry out all cellular processes within an organism and communication between organisms are correctly and effectively performed. In other words, it is the light / energy / electromagnetic field of each of our several trillion cells that is responsible for the action of all biochemicals – metabolic enzymes, proteins, hormones, etc. – and the function of every organ and system in the body. The coherent biophotons work in cooperation and synergy with each other to direct the millions of instantaneous processes of the body every second of every day that we live. We can clearly see that we are **energy** and as such, we generate our own (weak) electromagnetic field (energy field). Because of our electromagnetic field we will **always** interact with any other energy (radiation) – whether good or bad – that we are exposed to.

So ultimately what does this say about 'energy' and its role in our ability to maintain health and balance? In its most basic definition, **energy is information**. This information instead of being biochemical is vibrational in nature and is the orchestrator of all the millions of instantaneous and perfectly synchronized processes of the body. Health can be defined as the body having balanced information to direct its functions in the most effective way. **With this understanding, on a biophysical level, this means we need 'coherent energy' – i.e. ordered, balanced information – to maintain health and well-being.** It then follows that disordered or incoherent energy leads to the body receiving imbalanced information which leads to disease and ill-health. The unnatural man-made radiation from our modern technology feeds us these disordered, imbalanced energies / frequencies, and therefore, information which directs our cells to become likewise imbalanced and diseased. Again, we are energy and we will always interact with (i.e. take on information from) any other sources of energy / radiation that we are exposed to. Ultimately, the health of the body is dependent upon the balance and integration of both the biophysical (energetic) and biochemical (matter) aspects of life. We cannot have one without the other and as all humans function thus, it follows that all of us are being affected by the unnatural radiation of our modern technology.

What remains to be seen is how our ever-increasing exposure to all this unnatural radiation will affect each of us in the long term. As more and more research is being published each month, we are proving that our untested technology is positioning itself as the next health epidemic. Already, many people are becoming ill with a wide variety of symptoms and conditions which may or may not be properly recognized as resulting from Electrical Hypersensitivity (EHS).

The Consequences of Constant Radiation Exposure – Electrical Hypersensitivity (EHS)

EHS was originally known as 'radio wave sickness'. This term was first used by the Russians to describe an occupational illness developed by a large number of workers exposed to RF / microwave radiation. The symptoms that developed were called 'neurasthenic' and was based on the illness that many railroad and telegraph workers in the U.S. in the late 1800's suffered from. The term 'neurasthenia' has given way to the more popular term 'anxiety' or 'generalized anxiety disorder'. Illness by radio waves is now classed with illness by electricity and has been given the term 'Electrical Hypersensitivity' (EHS) [35].

The Symptoms of EHS

- Sleep problems / Insomnia
- Fatigue
- Depression
- Headaches
- Restlessness
- Irritability
- Difficulty Concentrating
- Numbness or Tingling
- Allergies
- Multiple Chemical Sensitivity
- Tinnitus
- Impaired Balance
- Nerve and Soft Tissue Pain
- Eye Inflammation
- Skin Complaints
- Infertility
- Forgetfulness
- Learning Difficulties
- Difficulty Finding Words
- Frequent Infections
- Sinusitis
- Lymph Node Swelling
- Joint and Limb Pain
- Dry Eyes and Mouth
- Episodic Hypertension
- Hormonal Disturbances
- Thyroid Disease
- Night Sweats
- Frequent Urge to Urinate
- Weight Increase
- Nausea
- Increased Risk of Cancer

People can experience one or more of these symptoms in either the short or long term after exposure to EMFs. The most common symptoms that develop are related to **sleep, fatigue, anxiety, depression, and muscular pain**. Also many people report feeling 'wired' – which is exactly how it feels to be interacting with unnatural radiation!

In taking a closer look at this symptom list we can see the link to the health effects that the most recent research (see Health Hazards of RF-EMF) is conclusively proving, namely immune, neurological, and hormonal dysfunction. What is particularly noticeable about these symptoms is that many people are already dealing with just these issues. How many today are diagnosed as Chronic Fatigue Syndrome, Hypothyroid, Adrenal Fatigue, MS, Autoimmune Disorders, Infertility, Depression / Anxiety Disorders, Autism, and ADD/ADHD which bear a striking resemblance to the symptom list above? How many of these same people are becoming increasingly difficult to treat and are described as 'resistant' to both standard medical and holistic therapies? The answer to both of these questions are that **many** people are being diagnosed and treated for a condition in which the underlying cause has not been identified and therefore not addressed appropriately. This is not to say that any of the above named conditions do not have numerous other causes, but the concomitant increase in wireless technology along with the rapid increase in these conditions in nearly the same time frame is more than just coincidental. The hard truth is that we cannot underestimate the harmful health effects of unnatural radiation.

Among the various conditions with a similar symptom picture, it is the close correlation with functional Adrenal Insufficiency (not Addison's Disease) that warrants closer examination. According to Dr. Robert O. Becker, it is well known that exposure to **any** unnatural electromagnetic field produces a **stress response** [36]. If the stress response becomes prolonged, the stress response system – which is the Adrenal Glands – becomes exhausted and the competency of the immune system decreases to levels below normal. Becker, in his book Cross Currents, cites a study evaluating microwave radiation on rats that clearly shows just such a stress response which was not what the study's author intended to prove. This stress response was determined by measuring the levels of plasma cortisol which is a stress hormone of the adrenal glands. The results of this study showed, among other things, that chronic exposure to microwave radiation at levels 20-times below the safe thermal levels (2.45 GHz at 0.5 mW/cm²) produced profound stress and ultimately exhaustion of the stress response system [36].

With many practitioners today talking about functional Adrenal Insufficiency and Chronic Inflammation from prolonged increased cortisol and its nearly ubiquitous presence, most will cite poor diet, busy high-pressured lifestyles, and victim / powerless beliefs about health/life as the main culprits. It would therefore seem that correcting these issues should be sufficient to resolve the problem. But what is now being found more and more frequently is that many people who have changed their diet, take supplements, exercise, optimize their schedule, and improved their attitudes are still dealing with their symptoms and are continuing to show abnormal adrenal / stress

patterns. This has led many practitioners to looking for a 'bigger hammer' to affect change for their patients. Amid this struggle for both patient and practitioner, there is an underlying stressor of EMF exposure that unless addressed will find full recovery elusive even with the best therapeutic protocols. To further make this point, many children are showing the same abnormal stress patterns (i.e. cortisol rhythm) as adults. While poor diet, nutritional deficiencies, vaccinations, antibiotics and the like can be cited as stressors, the degree to which children suffer from ADD/ADHD, Autism, Allergies, and frequent infections cannot be due to these factors alone. The missing piece to the Adrenal Dysfunction puzzle (along with many other conditions) is exposure to unnatural EMFs.

It is also interesting to note here that some of the more prevalent symptoms are psychological in nature. Many people are told their symptoms are 'all in their head' – meaning without physiological basis – when that is quite obviously not the case. It doesn't take much effort to recognize that people are more depressed, anxious, tired, and sleepless than ever before. In 2007, for the first time in the U.S., anti-psychotic drugs out sold anti-depression drugs to a combined whopping total of **\$25 billion**. In addition, sleep disorders such as insomnia cost the U.S. **\$100 billion** annually in lost wages and medical expenses and we spend another **\$1 billion** a year on sleep medications [37]. Again, while there are many culprits that we can point to for any number of health problems, the fact is our health is just as profoundly being eroded away by the unseen forces of unnatural man-made microwave, electrical and magnetic radiation.

As a clinically defined condition, severe EHS currently effects 3 – 5% of the population and is estimated that nearly 35% have a mild form of the condition. It is a recognized medical disorder in Sweden, a country which also has taken a stricter stance on exposure guidelines based on the evidence. In 2006 a study from Sweden was published which looked at EHS trends over the past 15 years and used this data to extrapolate future trends regarding EHS in the general population. The data indicated that **50% of the population will be electrically hypersensitive by the year 2017** [38]. While this is only an extrapolation based on past data, this is an alarming statistic since the growth in technology since 2004 (last year of data in study) has continued to increase at a rapid rate. This obviously does not take into account the recent U.S. switchover to Digital TV (which will be nearly global by 2012-2014), the increase in Wi-Fi, Wi-MAX (described as 'Wi-Fi on steroids'), Cell Towers / Masts, and the introduction of Smart Meters into some metropolitan areas in the U.S. and Europe.

Please note that **children** are especially sensitive to this radiation. Research is showing evidence of a **link between microwave radiation and ADD /ADHD and Autism**, both of which are nearly epidemic among children today!

In fact a 2007 study showed that children with Autism who had concurrent heavy metal toxicity and had been resistant to numerous detoxification protocols were able to finally begin clearing these metals when placed in an EMF free environment [39]. In addition, this study showed that heavy metals were cleared in a time and molecular weight-dependent manner after the electromagnetic radiation was eliminated which resulted in symptomatic improvement. The authors state based on these findings that radiation, especially from wireless devices, is a synergistic factor in the cause of Autism, either directly or indirectly, and acts in conjunction with environmental and genetic factors [39]. In another small study conducted by Dr. Dietrich Klinghardt, he was able to **predict the occurrence of Autism based on the EMF levels of the mothers sleeping environment during pregnancy** [40]. He has also found that pregnant women who sleep in strong electromagnetic fields will be more likely to have children who begin to exhibit neurological abnormalities such as neurological dysfunction, hyperactivity, and learning disorders within the first two years of life.

To evaluate if you have any symptoms of EHS and their severity go to the following [EHS Questionnaire](#).

Detection and Protection Solutions

Due to our current technology and its continuing advancement we need to learn what and where our exposures are occurring and then take appropriate, effective measures to protect ourselves and our families – whether we're at home, school, or work.

Step 1: Detection and Evaluation

You can purchase meters to detect what type and where the EMF 'hot spots' are at home, school, and work. It is important to pay special attention to living areas and bedrooms when evaluating your environment.

In order to evaluate both ELF-EMF and RF-EMF, you will need meters that detect and measure exposures from these different sources. This is best done with separate ELF and RF meters to ensure the most accurate readings.

Step 2: Protection

As discussed in detail above, we are all being exposed to and therefore affected by EMFs on a **biological level** with only outdated and grossly lax guidelines to assure us that all this unnatural, man-made radiation is 'safe'. Even though we need to press the government, health, and regulatory agencies to require more stringent regulations based on the now conclusive evidence of biological damage, there is also a need to engineer and manufacture biologically tested safe technology. Until these goals become a reality, it is up to each of us to reduce our exposure to EMFs as much as possible and provide ourselves with the most effective means of helping our bodies cope with and heal from this enormous daily stress. In doing so we prevent the wide array of symptoms and conditions associated with EHS in both the short and long term. This is especially important for children, the elderly, and those with immune challenges as they are particularly affected by EMFs. The following are the best ways forward in protecting from the health hazards of unnatural EMFs.

Protection Solutions from EMFs

- **Grounding / Earthing:**

This is one of the most profoundly simple and effective measures to help the body deal with unnatural EMFs. As discussed earlier (see Our Natural Electromagnetic Environment) all life on Earth, including human beings, have developed and evolved with the natural direct current and electromagnetic field of the planet. This current produces an abundant supply of free electrons on the surface of the Earth. The land masses and oceans of our planet are therefore providing an abundant supply of electrons to the human body **when it is directly connected to the Earth**. Throughout human history people have walked, lived, and slept in direct contact with the Earth. It has only been in the past 50 or so years that our way of living has changed. In particular, where we once used natural materials like leather for footwear, we now have rubber-soled shoes. This synthetic material is an insulator on our feet which literally disconnects us electrically from the ground we are walking on. Also too, many people work and live one or more levels off the ground surrounded by synthetic materials (i.e. carpets, building materials) and EMFs from modern technology, especially when sleeping. This again cuts us off from our natural state of connection with the Earth. It is this **direct connection with the Earth** which is the key to the utter simplicity of the benefits of Grounding / Earthing in protecting us from the harmful effects of EMFs.

Also of great importance is the fact that the electromagnetic field of the Earth provides the reference point for the biological cycles of the human body. This means that the Earth's EMF directly regulates the healthy functioning of our biological rhythms. These functions include sleep cycles, hormone production, digestive processes, nervous system function, immune response, and stress responses. Research has shown that being connected directly to the Earth (i.e. grounded) reduces the stress and inflammation hormone cortisol [41], improves sleep and increases the anti-cancer hormone melatonin [41,42], and improved autonomic balance of musculature and the left hemisphere of the brain [43].

The consequences of this disconnection from the Earth coupled with our now constant unnatural EMF exposures have revealed themselves as the myriad of symptoms and health conditions many people now experience. But the symptoms of EHS are only one part of the health story regarding our disconnection from the Earth. Modern medicine is now recognizing that the underlying cause of or contributor to more than 80 conditions ranging from Heart Disease, Diabetes, MS, Arthritis, Cancer, Gastrointestinal Disorders, Chronic Pain Syndromes, to Hypertension is **chronic inflammation**. Even within the symptom list for EHS, there are many which are inflammatory in nature.

The normal acute inflammation that occurs in response to a stress – such as an injury, infection, or emotional issue – consists of various cellular processes, which includes the secretion of free radicals by immune cells and the stress hormone cortisol by the adrenal glands. Once all the damaged cells and bacteria have been cleared away, the inflammatory process winds down, or at least it should. It is now known that for various reasons, such as chronic stress from EMFs, poor diet, medication, emotional issues, etc. that this process does not fully resolve itself. At this point cortisol increases and will cause a suppression of restorative immune functions. In addition, free radicals will move into other areas of the body and cause damage to healthy cells. This then taxes the repair process of the cells and eventually initiates the additional release of more free radicals by the immune cells and cortisol thereby leading to a vicious cycle of low-grade chronic or 'silent' inflammation and ultimately chronic disease. What is interesting to note here is that these chronic diseases of inflammatory origin or contribution have only become epidemic in the last 50 years, which is also the time frame when we have insulated ourselves from the Earth!

So how does being 'Grounded' or 'Earthed' protect us from these damaging EMFs and inflammation?

1. Discharge of Excess Body Voltage: Before we can discuss this mechanism, we need to first understand how the body comes to have an increased voltage. There are two methods by which the body becomes 'electrified' (i.e. increased body voltage).

The first is when the body is in close proximity to an electric field and refers to any electrical source (outlets, live wires, etc.) even when not in use. This mechanism is known as capacitive coupling. This is when an electric field on one conductor (i.e. AC voltage source) acts across a poorly conducting medium (i.e. air) to influence charges on a nearby conductor (i.e. human body). In essence, the AC voltage source acts as one plate of a capacitor, with the conductive tissues of the body acting as another plate [43, 46].

The second, and most significant method by which the body takes on increased voltage is from emitted electromagnetic radiation. Not only does this include using a Cell phone, Digital Cordless (DECT) phone, Wi-Fi, and other wireless devices close to the body, but also from more distant sources such as Cell Towers, Digital TV transmissions, Radar, etc. When exposed to this radiation the body, being a natural antenna (transmitter and receiver of 'information/energy'), receives, and through its conductive tissues and fluids, converts electromagnetic waves into currents [43]. Radiation from an electromagnetic source induces an alternating current in the body and a corresponding voltage.

When the body is insulated from the Earth (i.e. wearing rubber-soled shoes), **the body becomes a 'sink' for electromagnetic radiation.** The body then absorbs this radiation, **but cannot get rid of it.** This radiation gets converted to electric currents which cause vibration at the cellular level [33]. Remember from earlier, the modulated portion (data transmission) of this electromagnetic radiation is in a frequency range that causes harmful vibration at the cellular level. This then causes damage to the cell by displacing ions and destabilizing the membrane. Ultimately, this leads to membrane leakage and can produce the negative biological effects discussed earlier [33].

However, **if the body is in direct contact with the Earth** (i.e. **Grounded**), then the **Earth becomes the 'sink'** for the electromagnetic radiation. This means that the **body functions as a conductor and allows the radiation to pass through it before any current can be generated on a cellular level and cause damage** [43].

2. Free Radical Neutralization – Antioxidant Protection: In energetic terms, a free radical is a molecule which is missing an electron. Inflammation is therefore a result of a deficiency in electrons. Recent research has shown that the free electrons on the surface of the Earth act as free radical scavengers or neutralizers and therefore as antioxidants thereby reversing chronic inflammation and preventing it from happening in the future [44,45]. These free electrons are electrically conducted from the surface of the skin into the internal tissues and organs. This process has also been demonstrated in micro-current therapy and acupuncture [45].

As can be seen from this information, **being 'Grounded' or 'Earthed' is one of the most effective means for protecting from the damaging effects of EMFs!** But how do we accomplish this direct connection with the Earth? As previously stated all we need to do is go barefoot on the grass / beach, swim in the ocean, or sleep on the ground while camping. Obviously, this is an unrealistic option for nearly all of us on regular basis depending on where we live and work. Fortunately there are several very easy alternatives to help us stay connected with the Earth which include:

- Wear natural-soled shoes (i.e. leather) instead of synthetic rubber/plastic shoes to keep your connection with the Earth.
- Use a **Grounding / Earthing Mat** - this is an ideal option for daytime use at home (while using computers, video games, etc.) or at the office. Easily and effectively keep yourself grounded while working, playing, or doing homework!
- **Most importantly use a Grounding / Earthing Bed Pad at night while you sleep!**

These scientifically tested and proven effective bed pads ground the body to help restore natural biological rhythms, reduce inflammation, improve sleep quality, increase melatonin levels, normalize the stress hormone cortisol, and alleviate chronic pain [41,42,43,44,45]. What makes the bed pad so effective is that it is being used **at night** when the body naturally does the majority of its healing and repair processes. When we go to bed at night our nervous system is supposed to enter into the Parasympathetic state in which the processes of rest, repair, and regeneration take center stage. If the body continues to be stressed at this time of natural healing it will stay in a Sympathetic mode which favors the processes of activity (i.e. 'fight or flight' response). Having the body protected and supported through Grounding / Earthing at this crucial time allows the body to enter into a healthy Parasympathetic state so that all these vital healing

functions can be efficiently carried out thereby aiding our total health and well-being. If we cannot switch on our 'healing system' while we sleep at night, or even have difficulties in sleeping in general, we will not be able to repair and heal as we should from the now constant exposure to unnatural radiation.

Having a protected sleep space by means of Grounding / Earthing is imperative in order to keep ourselves and our children healthy in both the short and long term from constant EMF exposure!

Other EMF Protection Measures

- Eliminate all sources of EMF exposure that you can in your home – especially in Bedrooms and Living Areas
- Replace Wireless devices with wired options – i.e. replace Wi-Fi with wired cable for internet connection.

NOTE: Beware of multi-functioning routers (cable, internet, phone) – make sure that the wireless signal is turned off as many remain on/ transmitting unless you disable it or have your cable company /internet provider turn it off for you. It will still function just fine for all other services.

- Use corded phone instead of a cordless phone
- Cell Phone Protection Measures:
 - To reduce Cell Phone radiation use a **BlueTube Headset with Air Tube Technology** to reduce SAR to 0.0009 W/kg.
 - Be aware that even a low SAR is not always a guarantee of safety. Some phones are more efficient (i.e. lower power) than others, so it is wise to use the BlueTube Headset regardless of SAR.
 - Use the Speakerphone function of your cell phone or Text to keep the radiation away from the head.
 - Use phone in areas with the best signal (i.e. 'more bars') which can reduce emissions up to 500 times.
 - Keep the calls short – health effects add up with increased time of exposure.

- Use **Shielding Materials to block RF Radiation**. Use **Swiss Shield™ Fabric** to make curtains or bed canopies to block radiation from Cell Towers, Wi-Fi, Digital TV, or other uncontrollable sources of RF radiation from entering your environment.
- Use Demand Switches to cut power off to bedrooms while sleeping.
- Move furniture and appliances to reduce exposures especially in Bedrooms and Living Areas (i.e. move alarm clock at least 3 feet away from head, move bed at least 6 inches from wall)
- Sleep on a wood frame bed and latex mattress (no metal springs)
- Don't use a Microwave Oven
- Don't use CFL bulbs. Opt instead for LED or regular incandescent bulbs.

Conclusion

It is easy to be unaware of or dismiss something which we cannot see or feel as being hazardous to our health. Oftentimes we take for granted or assume that in order for a product to be sold to us it must have been tested and proven safe. As we reasonably, albeit naively, assume if it were 'bad' for us then it never would be allowed on the market. If only this level of testing and safety were truly driving the introduction of new technology to the public instead of the more common traits of greed and competition. In our push to develop and then exploit our technological advances, very little attention is given to how these new and ever-increasing devices interact and influence our human biology and the biology of all living things. As a society we have become dependent upon, even addicted some would say, to our technology. But as the mounting evidence shows we are paying a very steep price for all the advantages and conveniences of our modern lifestyle. While it is obviously unrealistic and far too simplistic to suggest going backwards, we can however find a more healthful way forward.

In order to do this we need to see our technology with new eyes and its ability to serve mankind not only for its commercial benefits, but for the protection of **all life** on the planet. To many this may seem unreasonable in a world where money and power direct the course of human events, but the reality of our situation can no longer be ignored and in part it will be our ability to create biologically safe technology that will determine the health and well-being of humanity in the years to come. As we work for these goals we must take action now for ourselves and our families to protect and heal from the insidious health hazard of unnatural, man-made EMFs. The tools for helping our families are quite simple yet absolutely crucial for restoring health and balance once more. With a 'health care', or rather, 'disease care' system in shambles, a proliferation of biologically untested technology with its now proven negative biological effects, can only highlight the fact that even the best that modern medicine has to offer is not going to fix these problems. It may put a band-aid on it, but it will be woefully inadequate to stem the tide of health problems that are already beyond the reach of medicine to do anything more than manage. It is those who now deal with Electrical Hypersensitivity that, like canaries in a coal mine, are sounding the warning call for us all and we would be wise to listen to their message.

References

1. Chevalier G. (2007). The earth's electrical surface potential: A summary of present understanding. California Institute for Human Science, Encinitas, CA. January 2007.
2. Abraham G.E., Fagan C.L., and Himmel P.B. (2003). Effects of exposure to electromagnetic potential pulsed at the Schumann fundamental frequency on patients with chronic fatigue syndrome. *Original Internist*. September 2003.
3. Mitsutake G., Otsuka K., Hayakawa M., Sekiguchi M., Cornelissen G., & Halberg F. (2005). Does schumann resonance affect our blood pressure? *Biomed Pharmacother*. October 2005; 59 (Supp 1): S10-S14.
4. EM-Radiation Trust. (n.d.). *Re-Wire Me eMagazine*. Retrieved August 5, 2009 from www.rewire.me.
5. Slesin L. (June 11, 2009). The conceits of setting EMF standards. *Microwave News*. 29:5. Retrieved December 5, 2009 from www.microwavenews.com/newscomment.html.
6. National Council on Radiation Protection and Measurements. (June 13, 1995). *NCRP draft recommendations on emf exposure guidelines (section 8)*. Retrieved December 5, 2009 from www.microwavenews.com/ncrp1.html.
7. Ahlbom A, etal. (2000). A pooled analysis of magnetic fields and childhood leukemia. *Br J Cancer*. 83(5): 692-698.
8. Greenland S., Sheppard A.R., Kaune W.T., Poole C., & Kelsh M.A. (2000). A pooled analysis of magnetic fields, wire codes, and childhood leukemia. Childhood leukemia-EMF study group. *Epidemiology*. 11(6): 624-634.
9. Maslanyj M.P., etal. (2007). Investigation of the sources of residential power frequency magnetic field exposure in the UK childhood cancer study. *J Radiol Prot*. 27(1): 41-58.
10. Ahlbom A., cardis E., Green A., Linet M., Savitz D., & Swerdlow A. (2001). Review of the epidemiologic literature on emf and health. *Environ Health Perspect*. 109(Suppl 6): 911-933.
11. Draper G., Vincent T., Kroll M.E., & Swanson J. (2005). Childhood cancer in relation to distance from high voltage powerlines in england and wales: A case-control study. *BMJ*. 330(7503): 1290.
12. Tynes T., Klaeboe L., and Haldorsen T. (2003). Residential and occupational exposure to 50 Hz magnetic fields and malignant melanoma: A population based study. *Occup Environ Med*. 60(5): 343-347.
13. O'Carroll M.J. and Henshaw D.L. (2008). Aggregating disparate epidemiological evidence: Comparing two seminal emf reviews. *Risk Anal*. 28(1): 225-234.
14. Feychting M., Jonsson F., Pederson N.L., and Ahlbom A. (2003). Occupational magnetic field exposure and neurodegenerative disease. *Epidemiology*. 14(4): 413-419; 427-428.
15. Hakansson N., Gustavsson P., Johansen C., & Floderus B. (2003). Neurodegenerative diseases in welders and other workers exposed to high levels of magnetic fields. *Epidemiology*. 14(4): 420-426; 427-428.

16. Garcia A.M., Sisternas A., and Hoyos S.P. (2008). Occupational exposure to extremely low frequency electric and magnetic fields and alzheimer's disease: A meta analysis. *Int J Epidemiol.* 27(2): 329-340.
17. Lee G.M., Neutra R.R., Hristova L., Vost M., & Hiatt R.A. (2002). A nested case-control study of residential and personal magnetic field measures and miscarriages. *Epidemiology.* 13(1): 21-31.
18. Li D.K., etal. (2002). A population-based prospective cohort study of personal exposure to magnetic fields during pregnancy and the risk of miscarriage. *Epidemiology.* 13(1): 9-20.
19. Fews A.P., Henshaw D.L., Keitch P.A., Close J.J., & Wilding R.J. (1999). Increased exposure to pollutant aerosols under high voltage power lines. *Int J Radiat Biol.* 75(12): 1505-1521.
20. Henshaw D.L., Ward J.P., and Matthews J.C. Can disturbances in the atmospheric electric field created by powerline corona ions disrupt melatonin production in the pineal gland? *J Pineal Res.* 45(4): 341-350.
21. Henshaw D.L. (2002). Does our electricity distribution system pose a serious risk to public health? *Med Hypotheses.* 59(1): 39-51.
22. Havas M. (2006). Electromagnetic hypersensitivity: Biological effects of dirty electricity with emphasis on diabetes and multiple sclerosis. *Electromagnetic Biology and Medicine.* 25: 259-268.
23. National Institute of Environmental Health Services, National Institute of Health. (May 1999). *Health effects from exposure to power-line frequency electric and magnetic fields.* Retrieved December 5, 2009 from www.niehs.nih.gov/health/docs/niehs-report.pdf.
24. International Agency for Research on Cancer, World Health Organization. (2002). *Non-ionizing radiation part 1: Static and extremely low frequency (ELF) electric and magnetic fields.* Retrieved December 5, 2009 from <http://www.cdc.gov/niosh/topics/EMF/>.
25. Henshaw D.L. and Reiter R.J. (2005). Do magnetic fields cause increased risk of childhood leukemia via melatonin disruption? *Bioelectromagnetics.* Suppl 7: S86-97.
26. Binhi V. (2008). Do naturally occurring magnetic nanoparticles in the human body mediate increased risk of childhood leukemia with emf exposure? *Int J Radiat Biol.* Jul, 84(7): 569-579.
27. Blank M. (2008). Protein and DNA reactions stimulated by electromagnetic fields. *Electromagn Biol Med.* 27(1): 3-23.
28. Office of Engineering and Technology, Federal Communications Commission. (August 1999). *Questions and answers about biological effects and potential hazards of radiofrequency electromagnetic fields.* OET Bulletin 56: Fourth Edition, August 1999. Retrieved August 21, 2009 from <http://www.fcc.gov/oet/rfsafety/>.
29. Office of Engineering and Technology, Federal Communications Commission. (August 14, 2003). *Commission denies EMR network application for review contesting decision on petition for inquiry regarding environmental effects of radiofrequency radiation.* Retrieved August 21, 2009 from <http://www.fcc.gov/oet/rfsafety/>.
30. AUVA Insurance Company (Austria). (July 21, 2009). *AUVA report: Nonthermal effects confirmed; exposure limits challenged; precaution demanded.* Retrieved August 22, 2009 from <http://www.diagnose-funk.org>.

31. Anslow, M. (2007). The gathering brainstorm. *The Ecologist*. December 2007, 43-48. Retrieved March 14, 2009 from <http://www.weepinitiative.org/>.
32. Waldmann-Selsam C., Aschermann C., and Kern, M. (February 12, 2009). *Adverse health effects form the operation of digital broadcast television stations*. Open Letter to President Obama, Congress, and US Citizens. Retrieved July 26, 2009 from <http://www.globalresearch.ca/index.php?context=va&aid=12596>.
33. Goldsworthy, A. (July 2009). *Some facts about cell phone radiation*. Retrieved August 4, 2009 from <http://www.mastsanity.org>.
34. Li K.H. (1992). Coherent radiation from DNA molecules. In F.A. Popp, K.H. Li, & Gu, Q. (Eds.), *Recent advances in biophoton research and its applications* (pp. 157-163). Singapore: World Scientific Publishing Co.
35. Firstenberg A. (September 2001). *Radio Wave Packet*. Retrieved December 5, 2009 from http://www.dirtyelectricity.ca/electrical_hypersensitivity.htm.
36. Becker, R.O. (1990). *Cross currents: The perils of electropollution, the promise of electromedicine*. New York: Penguin.
37. Wilbur V. (2006). Insomnia and sleep disorders. In V.P. Arcangelo and A.M. Peterson (Eds.), *Pharmacotherapeutics for advanced practice* (pp. 639-654). Philadelphia: Lippincott Williams and Wilkins.
38. Hallberg O. and Oberfeld G. (2006). Will we all become electrosensitive? Letter to the Editor. *Electromagnetic Biology and Medicine*. 25: 189-191.
39. Mariea T.J. and Carlo G.L. (2007). Wireless radiation in the etiology and treatment of autism: Clinical observations and mechanisms. *J Aust Coll Nutr. & Env. Med.* 26(2): 3-7.
40. Mercola, J. (April 30, 2009). *Where you sleep matters if you want a healthy baby*. Retrieved December 29, 2009 from <http://articles.mercola.com>.
41. Ghaly M. and Teplitz D. (2004). The biologic effects of grounding the human body during sleep as measured by cortisol levels and subjective reporting of sleep, pain, and stress. *The Journal of Alternative and Complementary Medicine*. 10(5): 767-776.
42. Ober A.C. (n.d.). Grounding the human body to neutralize bio-electrical stress from static electricity and emfs. *ESD Journal*. Retrieved December 7, 2009 from <http://www.esdjournal.com/articles/cober/ground.htm>.
43. Chevalier G., Mori K., and Oschman J.L. (n.d.). The effect of earthing on human physiology. California Institute for Human Science, Unpublished Research Report. Retrieved December 7, 2009 from http://www.sleepingearthed.com/pdf/EFX_science_Physiology.pdf.
44. Amalu W. (n.d.). Medical thermography case studies. Retrieved December 7, 2009 from <http://www.agroundedlife.com/Research.htm>.
45. Oschman J.L. (2007). Can electrons act as antioxidants? A review and commentary. *The Journal of Alternative and Complementary Medicine*. 13(9): 955-967.

46. Applewhite R. (April 29, 2004). The effectiveness of a conductive patch and a conductive bed pad in reducing induced human body voltage via the application of earth ground. Retrieved December 7, 2009 from <http://www.agroundedlife.com/Research.htm>.
47. Vithoukas G. (1980). *The science of homeopathy*. New York: Grove Press.