

# Grounding – a Scientific View

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*Focus: A summary of current research on grounding on how it has the potential to influence human physiology, and the possible resultant impact on Electro-Hypersensitivity (EHS)*

Something as basic and inexpensive as taking off your shoes and standing in the grass to reap health benefits might sound too good to be true. There is evidence that shows simply standing on the earth with bare feet, a practice known as grounding or earthing, can have real improvements on how the body manages stress, anxiety, and even especially inflammation and autoimmune disorders.

Two of the pioneers of grounding are Stephen T. Sinatra, M.D. and Clint Ober. Brittany Leitner had an interview with Step Sinatra, Stephen's son, in which he revealed the following:

"The earth is like a battery," says Step.<sup>2</sup> "High up in the ionosphere is where the earth is positively charged and, on the surface, the charge is negative. The human body is also a battery." Essentially, when you directly connect to the earth, you tap into the natural rhythmic pulsations flowing through and emanating through the earth's surface, he explains.

Scientifically defined, grounding is the process of removing the excess charge on an object by means of the transfer of electrons between it and another object of substantial size, such as the earth.<sup>1</sup> When a charged object is grounded, the excess charge is balanced by the transfer of electrons between the charged object and a ground, in this case the earth. The ground is capable of transferring electrons to or receiving electrons from a charged object in order to neutralize that object. When a person is grounding, (also called earthing), it refers to contact with the earth's surface electrons by walking barefoot outside or sitting, working, or sleeping indoors connected to conductive systems. Through this process, excess positive charge in a person's body is equalised.

Throughout the world, electrical systems are connected to the earth's surface and its negative charge to maintain stability and safety. These systems, from large grids and power stations to homes, buildings, and factories as well as the machinery and appliances that are operated by electricity, are thus said to be *grounded* or *earthed*.

Research conducted for more than a decade has demonstrated that Earth's charge and storehouse of electrons represent a major natural resource of health. Research on biological grounding is suggesting that this very same electric charge on the planet's surface plays a governing and nurturing role for both the animal and plant kingdoms, which takes on a form of electric nutrition. It appears to have the potential to restore, normalize, and stabilize the internal environment of the human body's countless bioelectrical systems that govern the functions of organs, tissues, cells, and biological rhythms.<sup>4,5</sup>

Oschman (2008) indicates that when earthing during sleep, it normalizes the daily cortisol rhythm, improves sleep and reduces pain and inflammation. Direct electrical connection with the earth enables diurnal (daily) electrical rhythms and electrons to flow from the earth to the body. Electrons are thought to act as natural anti-oxidants by neutralizing positively charged inflammatory free radicals.<sup>4</sup> He furthermore indicates that research has emphasized the significance of charge transfer in relation to the scavenging or neutralization of free radicals delivered to sites of injury during and after the oxidative burst.<sup>5</sup>

## **Grounding benefits**

Significant benefits are reported such as better sleep, reduced inflammation and pain, and improved blood flow. This is as a result of the transfer of the earth's free or mobile electrons from the ground into the body, a transfer resulting in rapid, sometimes instant, and significant physiological changes now documented in multiple published studies, most of them peer reviewed.<sup>6</sup> Chevalier et al (2011) concludes that emerging evidence shows that contact with the earth, whether being outside barefoot or indoors connected to grounded conductive systems may be a simple, natural, and yet profoundly

effective environmental strategy against chronic stress, autonomous nervous system (ANS) dysfunction, inflammation, pain, poor sleep, disturbed heart rate variability (HRV), hypercoagulable blood, and many common health disorders, including cardiovascular disease. The research done to date supports the concept that grounding or earthing the human body may be an essential element in the health equation along with sunshine, clean air and water, nutritious food, and physical activity

In the day of our grandparents, and those before them, they often walked barefoot outside, gaining the natural benefits of grounding. However, in our modern lifestyle, grounding has become something of the past. Could this disconnect with the earth's electrons represent a critically important and overlooked contribution to physiological dysfunction and to the alarming global rise in inflammatory-related chronic diseases?

The grounding studies conducted to date indicate multiple and rapid effects achieved by what appears to be the body's broad uptake and use of electrons received from the earth.<sup>3</sup> Benefits include:

1. Reduced inflammation and pain

Grounding reduces or even prevents the cardinal signs of inflammation following injury: redness, heat, swelling, pain, and loss of function. Most pains, including the most severe, are due to inflammation and typically respond rapidly to Grounding. Healing-related pains usually lessen, often significantly, in intensity and duration.<sup>9-13</sup>

2. Improved blood flow and reduced blood viscosity

Thick blood that tends to be sludgy and clumped is a typical sign of cardiovascular disorders and diabetes. Two studies investigated the effects of Grounding on blood viscosity.<sup>17,18</sup> Two additional studies showed that blood flow regulation and circulation to the head, face, torso, and extremities were enhanced within a 1-hour session of grounding in a chair.<sup>19,20</sup> All these studies found significant systemic benefits, affecting overall and local health, and suggest that grounding may represent a complimentary preventive and therapeutic strategy against diabetes and cardiovascular disease.

3. Reduced stress

Cortisol, a mediator and marker of stress, is associated with emotional and physiological stress, inflammation, and sleep dysfunction. Chronic elevation of cortisol from stress can lead to a disruption of the body's circadian rhythms. Consequently, it contributes to sleep disorders, hypertension, cardiovascular disease, decreased bone density, decreased immune response, mood disturbances, autoimmune diseases, and abnormal glucose levels. Emotional and physical stress are aggravating factors for pain and psychological disorders.<sup>3</sup>

Sinatra et al. highlights that as a result, any natural method for relieving stress has enormous potential to prevent or decrease the negative effects of most diseases.<sup>3</sup> They cite that in multiple studies, grounding has been documented to exert a beneficial effect on stress, a likely result of systemic influences in the body, including

1. a normalizing influence on cortisol, the stress hormone;
2. a calming impact on the electrical activity of the brain;
3. a normalisation of muscle tension;
4. a rapid shift from a typically overactive expression of the sympathetic nervous system, associated with stress, into a parasympathetic, calming mode within the autonomic nervous system (ANS) that regulates heart and respiration rates, digestion, perspiration, urination, and even sexual arousal; and
5. within the ANS, an improvement in heart rate variability (HRV). The miniscule variations in the heart's beat-to-beat interval, that serves as an accurate reflector of stress. Low HRV is associated with stress-related disorders, cardiovascular disease, diabetes, mental health issues, and reduced lifespan. Grounding improves HRV to a degree far beyond mere relaxation. The study authors concluded that "grounding appears to be

one of the simplest and yet most profound interventions for helping reduce cardiovascular risk and cardiovascular events."

#### 4. Improved sleep

This effect is one of the most common responses from people, including many insomniacs, after they start grounding. In a 2004 study, 12 participants slept grounded for 8 weeks.<sup>9</sup> The benefits they reported included:

- a. Falling asleep faster; and
- b. Waking fewer times during the night.

While different people respond differently, for many grounded sleep reduces pain from inflammation and thereby improves quality of sleep.

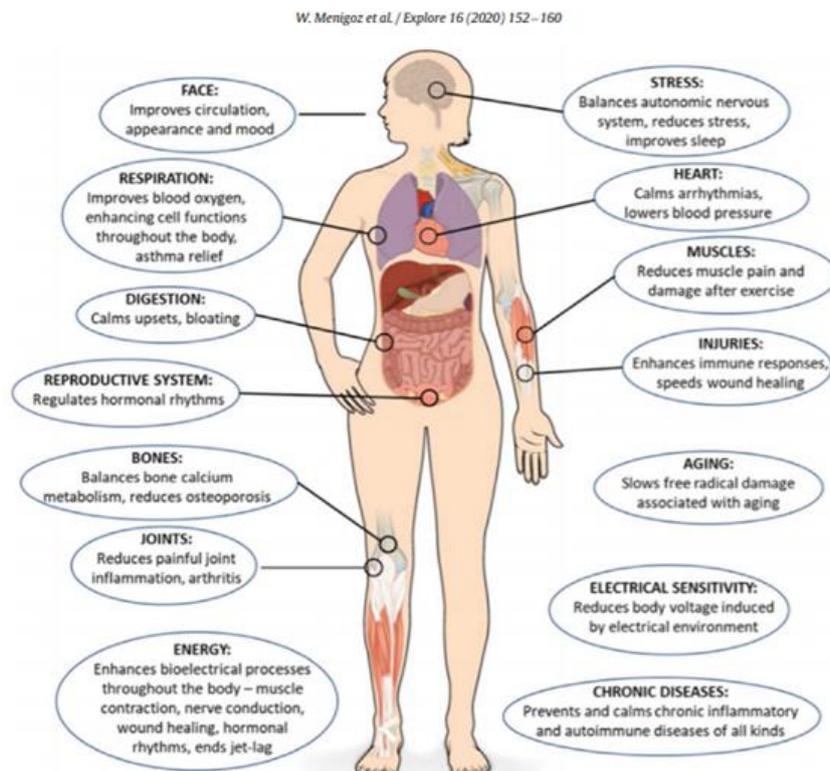
#### 5. Improved energy

Sleeping grounded provides more morning energy as well as vitality throughout the day, and a decrease in fatigue. An explanation could be due to improvement in the day/night cortisol rhythm that in turn improves sleep quality.<sup>9</sup>

#### 6. Improved response to trauma and injuries and accelerated wound healing

Faster-than-normal wound and surgical healing has been reported frequently through the years. Accelerated wound healing, whether involving injury, surgery, or burn, may result from a combination of reduced inflammation as well as improved circulation, vasodilation and lower blood viscosity, facilitating the delivery of healing factors to the area of injury.<sup>13</sup>

Below is a graphic produced by Wendy Menigoz, Tracy T.Latz, Robin A.Ely, Cimone Kamei, Gregory Melvin and Drew Sinatra.<sup>8</sup> They published an article called *Integrative and lifestyle medicine strategies should include Earthing: Review of research evidence and clinical observations*.



They indicate the clinical health benefits from grounding.

### **What is happening behind the scenes?**

According to Sinatra et al. (2017), humans are bioelectrical beings, with hearts, brains, and immune and endocrine systems being regulated by internal bioelectrical signals. Electrons play a key role, they are intimately involved in the body's countless processes. They make it possible for atoms to bond with other atoms and form molecules.<sup>3</sup>

During the normal processes of metabolism, the body generates what are called 'reactive oxygen species' which are commonly referred to as 'free radicals'. These compounds appear to be important, at least in part because they have the ability to attack and destroy unwanted pathogens within the body such as bacteria and viruses. However, too many free radicals are a bad thing, and have been implicated in chronic disease and well as the process of aging.

Free radicals are involved in the process known as inflammation, which is part of the healing process. However, chronic low-grade inflammation throughout the body may lead to pain and other problems in the muscles and joints and is also believed to be a key driving factor in many chronic diseases, including autoimmune disease.

Free radicals lack sparks of energy known as 'electrons'. One way to neutralise them is to give them electrons, and these can be supplied by nutrients such as vitamins A, C and E, and plant substances known as 'polyphenols' (found in, among other things, tea, coffee, cocoa and apples). However, substances we eat and drink are not the only way to get electrons into the body, grounding does this too. Grounding allows electrons to flow into the body where, in they can neutralize excess free radicals and inflammatory damage.

Although oxygen is essential to metabolism and life, the oxygen molecule itself is extremely toxic and the body uses a variety of antioxidant processes to keep the concentration of oxygen low in the tissues. Too much oxygen creates oxidative stress. One of the key reactions in living cells, of course, is the electron transport chain in mitochondria that produces adenosine triphosphate (ATP), the energy source for all living processes. Sinatra et al.<sup>3</sup> highlights that studies have shown that providing electrons to animals dramatically increases ATP production and protein synthesis. Both these processes are essential for wound healing.

Electrons from the earth serve as a potent neutralizer of electron-seeking free radicals. It means that grounding helps your body deal with free radicals from our toxic lifestyles.

We are all bombarded with chemicals every day, in our food, in the air, in our personal care products, in our cleaning chemicals, and more. All of these causes oxidative stress. Oxidative stress is an imbalance between these free radicals and antioxidants in your body. As Sinatra et al<sup>3</sup> explained, your body needs electrons to support ATP production, which ultimately ensures that your cells are functioning optimally and produces energy your body so sorely needs.

Sinatra et al<sup>3</sup> goes on by saying the term electron deficiency may be appropriate to describe the largely ungrounded status of most of humanity. As noted, the modern lifestyle, notably the wearing of shoes with synthetic soles, has severed us from our electric roots, our connection with the earth and its natural supply of electrons.

Their research indicated that the immune system may not function efficiently in an organism that has an insufficiency of free electrons. Grounding provides electron reinforcements.

The manner by which grounding produces rapid and measurable improvements in whole-body physiology was first introduced by Nobel Laureate Albert Szent-Györgyi in 1941 and again in the 1980s.

## Where does EHS fit in?

In physics, electromagnetic radiation (EM radiation or EMR or known as electromagnetic frequencies (EMF)) refers to the waves (or their quanta, photons) of the electromagnetic field, propagating through space, carrying electromagnetic radiant energy.<sup>15, 21</sup>

It includes radio waves, microwaves, infrared, (visible) light, ultraviolet, X-rays, and gamma rays. All of these waves form part of the electromagnetic spectrum.

Dr Pall, in his book *5G Risk: The Scientific Perspective - Compelling Evidence for Eight Distinct Types of Great Harm Caused by Electromagnetic Field (EMF) Exposures and the Mechanism that Causes Them*, he highlights that EMFs:<sup>22</sup>

- “1. Attack our nervous systems including our brains leading to widespread neurological/neuropsychiatric effects and possibly many other effects. This nervous system attack is of great concern;
2. Attack our endocrine (that is hormonal) systems. In this context, the main things that make us functionally different from single celled creatures are our nervous system and our endocrine systems – even a simple planaria worm needs both of these. Thus, the consequences of the disruption of these two regulatory systems are immense, such that it is a travesty to ignore these findings;
3. Produce oxidative stress and free radical damage, which have central roles in essentially all chronic diseases;
4. Attack the DNA of our cells, producing single strand and double strand breaks in cellular DNA and oxidized bases in our cellular DNA. These in turn produce cancer and also mutations in germ line cells which produce mutations in future generations;
5. Produce elevated levels of apoptosis (programmed cell death), events especially important in causing both neurodegenerative diseases and infertility;
6. Lower male and female fertility, lower sex hormones, lower libido and increased levels of spontaneous abortion and, as already stated, attack the DNA in sperm cells;
7. Produce excessive intracellular calcium and excessive calcium signaling; and
8. Attack the cells of our bodies to cause cancer. Such attacks are thought to act via different mechanisms during cancer causation.”

The BioInitiative Report published in 2012 is an extensive compilation of research on the possible effects of EMF.<sup>23</sup>

Below is an extract from an article by Dr Pall with substantiated research on the effects of EMF.<sup>24</sup>

**Table 1**  
Summary of health impacts of Wi-Fi EMF exposures.

Citation(s)	Health Effects
Atasoy et al. (2013); Özorak et al. (2013); Aynali et al. (2013); Çiftçi et al. (2015); Tök et al. (2014); Çiğ and Nazıroğlu (2015); Ghazizadeh and Nazıroğlu (2014); Yüksel et al. (2016); Othman et al. (2017a, 2017b); Topsakal et al. (2017)	Oxidative stress, in some studies effects lowered by antioxidants
Atasoy et al. (2013); Shokri et al. (2015); Dasdag et al. (2015); Avendaño et al. (2012); Yildiring et al. (2015); Özorak et al. (2013); Oni et al. (2011); Akdag et al. (2016); Papageorgiou et al. (2011); Maganioti et al. (2010); Othman et al. (2017a, 2017b); Hassanshahi et al. (2017)	Sperm/testicular damage, male infertility
Shokri et al. (2015); Dasdag et al. (2015); Çiğ and Nazıroğlu (2015); Topsakal et al. (2017)	Neuropsychiatric changes including EEG; prenatal Wi-Fi leads to post-natal neural development, increased cholinesterase; decreased special learning; Wi-Fi led to greatly lowered ability to distinguish familiar from novel objects, changes in GABA and cholinergic transmission
Avendaño et al. (2012); Atasoy et al. (2013); Akdag et al. (2016)	Apoptosis (programmed cell death), elevated apoptotic markers
Saili et al. (2015); Yüksel et al. (2016); Topsakal et al. (2017)	Cellular DNA damage
Çiğ and Nazıroğlu (2015); Ghazizadeh and Nazıroğlu (2014)	Endocrine changes incl.: Catecholamines, pancreatic endocrine dysfunction, prolactin, progesterone and estrogen
Aynali et al. (2013)	Calcium overload
Othman et al. (2017a)	Melatonin lowering; sleep disruption
Othman et al. (2017a)	MicroRNA expression (brain)
Çiftçi et al. (2015)	Abnormal postnatal development
Saili et al. (2015)	Disrupts development of teeth
Lee et al. (2014)	Cardiac changes, blood pressure disruption; erythrocyte damage
	Growth stimulation of adipose stem cells (role in obesity?)

EMFs are present whether you are grounded or not. When you are grounded, you become like a Faraday cage and the Faraday cage effect prevents EMFs generated by the electric wires of your home from penetrating your body. They are reflected as a mirror reflects light.<sup>25</sup> A Faraday cage is a metal enclosure used to block electromagnetic fields. Grounding drops the voltage on your body to nearly zero.

These kinds of results speak loud and clear to the safety issue of Earthing. Yes, it is therapeutic to be outdoors barefoot in nature and ground yourself. Yet, by plugging into a properly grounded wall outlet indoors you can safely and beneficially ground yourself. In the process, you become buffered from common AC voltage surrounding you that emanates from wires, and most electronic equipment and appliances. You instantly equalize electrically with the Earth’s natural energy. You become an extension of Mother Earth.

**The missing link**

Considering the research on the benefits of grounding, and considering the possible health risks of EMF, it is difficult not to see the relation. Let’s look at 3 significant examples:

Research by Dr Pall shows that EMF:	Research by Sinatra et al shows that Grounding:
Attacks the nervous system	Can cause a shift from a typically overactive expression of the sympathetic nervous system, associated with stress, into a parasympathetic, calming mode within the autonomic nervous system (ANS) that regulates heart variability, respiration rates, and digestion
Attacks the endocrine system	Can regulate hormonal rhythms
Produces oxidative stress	Can slow free radical damage

Given the above links, it is highly recommended that more research is done to confirm if a relation exists. It is advised that future samples of testing be increased, to increase validity and reliability of results.

### **Are there any risks to grounding?**

Sinatra et al<sup>3</sup> highly recommends grounding, with one caveat. Because of the broad physiological effects generated by grounding, medication dosages may be impacted. This clinically relevant issue is discussed in the Earthing book and on the Earthing Institute's Web site. As an example, the combination of grounding and warfarin (Coumadin) has the potential to exert a compounded blood thinning effect and must be supervised by a physician. Grounding may also improve thyroid function and glucose metabolism and possibly require an adjustment in medication dosages.

In our testing of indoor grounding systems, we have found that some people also experience detox symptoms known as the Herxheimer effect, especially in the first 2 weeks of grounding. It is assumed that this is because of the neutralisation of free radicals.

### **What can be concluded?**

Let's use the analogy of a bucket. If your body is a bucket and you fill it up with toxins, at some point your bucket will overflow. We bombard our bodies with an overload of environmental toxins, chronic antibiotic use, overuse of other toxic medications such as pain killers, sedentary living, emotional stress, and chemical exposure through personal care products and cleaning chemicals and high levels of consumption of unnatural, processed foods and drinks, including GMO foods. Once your bucket overflows, your immune system has had enough and will start being oversensitive. This could manifest in one of two ways, either MCS or EHS. Or in most cases, both. This is illustrated by Dr Russel Cooper who specialises in treating EHS patients.

In all of this, nobody thinks of their shoes, however, wearing shoes that do not ground you, is a source of chronic inflammation. Grounding research highlights this mistake that we make that the wrong footwear results in a disconnection with the earth's healing energy.

Reactions to grounding can vary drastically. Some people will notice a difference immediately while others take a few days or weeks. Others won't feel any changes, but measures of cortisol levels will show improvement. In general, it seems that the more inflammation one has, the more of a difference may be noticed from grounding.

Grounding research is at an early stage, but the evidence compiled thus far consistently demonstrates that a great frontier of health and healing potential has been opened—right beneath our noses, or, more specifically, right under our feet. Humans have abandoned nature in many ways. Grounding reconnects humans to one aspect that has been largely lost and overlooked.

It is strongly recommended that further research be done on grounding and its physiological effects, as well as the possible relation with EHS.

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