

Grounding the human body to earth reduces chronic inflammation and related chronic pain

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The purpose of this paper is to present evidence that grounding the human body to earth reduces chronic inflammation and related chronic pain. More specifically, the evidence presented demonstrates that, when the body is electrically grounded to the earth, the direct current (DC) voltage of the earth creates, in effect, a natural electron shield (faraday cage) on the surface of the body. This natural shield then prevents environmental 50-60 Hz electric fields from creating electron disturbances in the body that elevate free radical levels and promote chronic inflammation and related chronic pain.

Chronic inflammation and free radicals

The normal inflammatory response is, in part, a burst of free radicals produced by the immune system in response to an injury. This natural production of free radicals occurs to prevent infection and to promote healing at a site of injury.

In simple terms, a free radical is an electrically charged particle. This electrical charge occurs because the free radical is missing an electron. To become stabilized, a free radical must “steal” its missing electron from another molecule. When the electron is stolen from an invader (e.g., bacteria), the invader’s molecular structure is damaged, which leads to its death (as intended by the immune system). When there are no invaders left to destroy and when there is a lack of electrons available from antioxidants to stabilize excess free radicals, free radicals then turn to the only other source from which they can steal electrons – healthy cells. The resulting damage to and death of healthy cells, from loss of electrons to free radicals, further signals the immune system for additional help. This sets up a continuous autoimmune response (creating more free radicals), which promotes chronic inflammation and tissue damage, commonly referred to as oxidative stress.

Chronic overproduction of free radicals by the immune system results in inflammatory-related disease such as arthritis, arteriosclerosis, heart attack, Type II diabetes, lupus, MS, asthma, inflammatory bowel disease, etc. A classic example of the damage caused by excess free radical production is the chronic swelling and joint degeneration of arthritis.

A chronic inflammatory condition can only stop when the excess of electrically charged free radicals in the area of inflammation is stabilized and the attack on healthy cells ends.

Free radical levels are increased by exposure to environmental electromagnetic fields

It is known that exposure to environmental 50-60 Hz electromagnetic fields increases concentrations of free radicals, lengthens their lifespan, and enhances the probability that they can do damage to the body (Bonnafous 1999, Brezitskaia 2000, Cannistraro 1980, Eveson 2000, Fernie 2001, Fiorani 1997, Hanel, 2000, Jajte 2000, Koana 1997, Roy 1995, Simko 2001(A), Simko 2001(B), Scaiano 1995, Scaiano 1994(A), Scaiano 1994(B), Supino 2001, Varani 2000, Yoshikawa 2000, Zmyslony 1998).

The human body, in modern times, is most chronically exposed to common household and workplace 50-60 Hz electric fields that continuously radiate from all electrical wiring and plugged in cords. When the body is insulated from the earth and is in the proximity of an electric field, the body becomes a dipole antenna that measurably attracts an electric field's lines of force. This causes the lines of force to become denser between the body and the electric field's source. The known effect of an electric field on the body is that it excites (disturbs) electrons of the body and creates unnatural induced voltage in the body. (US Dept of Energy, DOE/EE-0040) (On The Physics of Fields, Dolbear, Science, Volume 14, Issue 360, 442-444.) Using a voltmeter referenced to earth, this disturbance of the body's electrons is measurable on the surface of the body as 50-60 Hz voltage.

The shielding effect of the earth's natural electric field

It is common knowledge (and demonstrable with a voltmeter) that physical contact with the earth maintains the human body at the natural electrical potential (voltage) of the earth. When the body is electrically coupled with the earth, the DC electrons of the earth and/or its related electric field, then residing on the surface of the body, absorb the excitation effects of 50-60 Hz environmental electric fields. By transferring (offsetting) the attraction of an electric field *from* the body (which has a limited supply of electrons) *to* the earth (which has an infinite supply of electrons), excitation of the body's electrons is significantly reduced. When the body is shielded with the DC of the earth, the electrons of the body are then protected from being disturbed and held "hostage" as 50-60 Hz induced body voltage and away from their normal functions. Shielding, via grounding, allows the body to have all of its electrons available to carry on their normal functions in the body, which include the stabilization of excess free radicals. [The shielding of electronic cables and electronic equipment by grounding their housing to the earth is widely used as a method to prevent internal electromagnetic interference – EMI.]

Humans were naturally grounded before modern times

It is not widely known that on the surface of the earth lies an invisible flow of electrons that encompasses the entire earth. Further, this natural flow of electrons and its related electric field also exists on the surface of all conductive objects (including people, plants and animals) in physical contact with the earth. The earth's electron current flow and its electric field also pulsate at approximately 10 Hz (similar to alpha brain waves) and follow a rhythmic 24-hour circadian rise and fall in amplitude. For example, as measured in Tucson, Arizona, the earth's current is weakest just before midnight, rises rapidly at 8AM, reaches a peak just before noon, decreases till 3PM, reaches a secondary peak between 5PM and 6PM, and again drops to near zero at midnight. This diurnal pattern is similar at any location on earth relative to the daily revolution of the earth. (*The Natural Electric Currents of the Earth*, Scientific Monthly, Vol 43, issue 1:47-57.)

The significance of the earth having a natural pulsating voltage is the fact that humans, before modern times, lived in direct physical contact with the earth. The human body at that time naturally conducted and maintained the earth's voltage on the surface of the skin and throughout the respiratory and gastrointestinal tracts (which are conductive). Today humans wear synthetic soled shoes and live in environments that electrically disconnect (insulate) the body from the earth. As a result the body no longer maintains the natural voltage of the earth on its surface and no longer resides under the protective umbrella of the earth's direct current electric field.

Grounding the body to earth reduces chronic inflammation

To demonstrate the effects of restoring the natural direct current and electric field of the earth to the surface of the body, individuals with long-term chronic inflammation were grounded to earth. Two methods of grounding the body are presented below.

Grounding methodology #1: A conductive patch (photo #1) is placed on the body near site of chronic inflammation. The patch is connected via a fuse-protected conductive wire attached to a ground rod placed directly in the earth (photo #2). (Examples below show typical results.)

Before: arthritic inflammation (ankle) **After: 7 nights using ground patch**



Before: Diabetes lower leg

After: 7 nights using ground patch



Grounding methodology #2: A conductive-grounded bed pad (photo #7). Bed pad is placed on top of mattress (fitted sheet goes on top of pad). Bed pad is connected via a fuse-protected conductive wire attached to a ground rod placed directly in the earth.

Grounding methodology #1, localized grounding (grounded electrode patch placed near site of inflammation) provides a path for the direct current of the earth to flow to a site of inflammation. The visual results produced by localized grounding (shown in photos #4 and #6) demonstrate that restoring the DC of the earth to the surface of the body stabilizes normal electron transfers (neutralizing excess free radicals) and reduces inflammation.

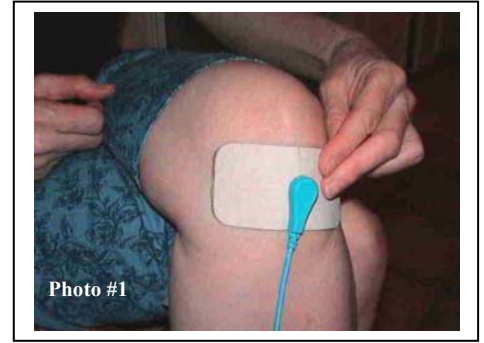


Photo #1

(Photo # 1 above) Subject with chronic inflammation in knee. Conductive patch placed on subject's knee. Ground rod (photo #2) placed directly in the earth.

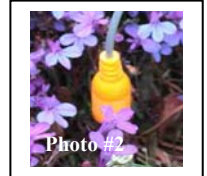


Photo #2

Subject (age 65) with chronic pain and inflammation in ankle (photo #3), reported that significant relief from pain occurred within minutes of grounding via the patch. After grounding for 7 nights (photo #4), inflammation disappeared and circulation significantly improved.

Subject (age 47) with Type II diabetes (photo #5). After 3 nights of grounding, subject reported significant relief from pain of neuropathy and improved sleep. After 7 nights (photo #6), reduction in redness and inflammation demonstrated significant improvement in circulation. Subject also reported improvement in energy levels and an overall sense of "increased well-being".



Photo #7

Grounding methodology #2 (sleeping on a ground plane such as a conductive grounded bed pad placed under a bed sheet) also stabilizes excess free radicals. When lying on an earthed ground plane, and insulated from direct contact with it by a sheet, the body does not conduct the DC of the earth but instead electrically couples with and conducts the DC electric field radiating from the earthed ground plane. This creates a natural shielding effect (faraday cage) on the surface of the body that prevents environmental 50-60 Hz electric fields from disturbing normal electron transfers in the body that otherwise elevate free radical levels.

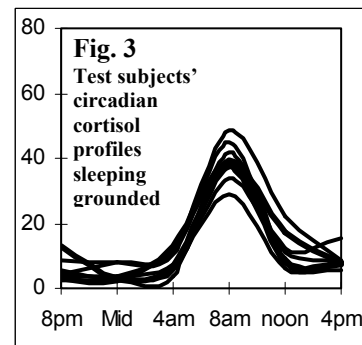
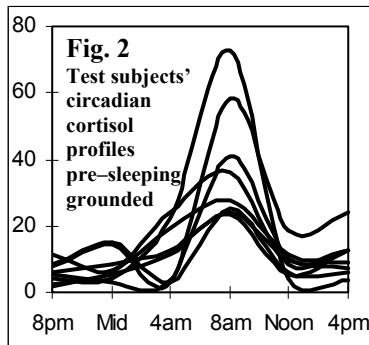
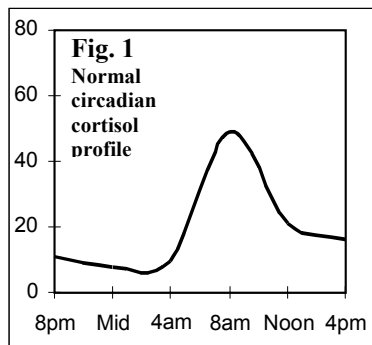
In a recent pilot study, conducted to identify the biological effects of grounding the human body during sleep, this second grounding method (sleeping on a grounded bed pad) was utilized.

During a six-week period, eight female subjects were grounded to the earth during sleep. Conductive bed pads were placed on their own beds (under the fitted sheet) and were connected to a fuse-protected ground wire attached to a ground rod that was placed directly in the earth outdoors.

The electric field induced body voltage (from exposure to common electrical wiring and cords near the bed), created on subjects' bodies while in bed, averaged 2.9 volts pre-grounding. Levels were significantly reduced, averaging 0.004 volts, when subjects slept on the earthed bed pads.

Sampling of AC electric field induced voltage measured on subjects' bodies while lying in their own beds		
Subject	Before Grounding	After Grounding
1	3.940 V	0.003 V
2	1.470 V	0.001 V
3	2.700 V	0.004 V
4	1.200 V	0.002 V
5	2.700 V	0.005 V
6	1.670 V	0.005 V
7	5.950 V	0.008 V
8	3.940 V	0.008 V

The circadian secretion of hormone cortisol, a known biomarker associated with stress and chronic inflammation, was measured in subjects pre- and post-grounding.



Cortisol measurements by Sabre Sciences Laboratory of San Diego, CA using a standard radioimmunoassay

In unstressed individuals the normal 24-hour circadian cortisol secretion profile follows a predictable pattern, lowest at 12 midnight and highest at 8AM (see figure 1). Abnormal cortisol secretion during sleep is associated with sleep disorders and chronic inflammation, and can also contribute to abnormal glucose levels, decreased immune response, mood disturbances, gastrointestinal disorders, chronic pain, fatigue, decreased bone density, autoimmune disease, high blood pressure and heart disease.

The pre- and post-grounding charts (figures 2 and 3) illustrate the significant stabilization of cortisol secretion as a result of sleeping grounded, with a resynchronization of the groups' circadian profile, much more in alignment with the normal circadian cortisol secretion profile. Seven of the eight females had a reduction in high to out-of-range nighttime cortisol, averaging a 53.7% reduction, and six of the eight subjects had a rise (averaging 34.3%) in 8AM levels to more normal levels. In the two subjects whose 8AM cortisol levels were abnormally high, their cortisol levels dropped 38%.

Subjects were also asked to record their subjective experiences of sleep, pain and emotional stress throughout the study period. Significant improvements in sleep as well as alleviation of emotional stress (irritability, anxiety and depression), were reported. Additionally all types of chronic pain were reported to be significantly reduced, indicating that inflammation levels in subjects' bodies decreased as a result of sleeping grounded (see case study reports below).

[The complete study, *The biological effects of grounding the human body during sleep, as measured by cortisol levels and subjective reporting of sleep, pain and stress*, Maurice Ghaly, M.D. and Dale Teplitz, M.A., will be published late 2003 / Journal of Alternative and Complimentary Medicine.]

Case study reports

Female age 53 – Post Menopausal

Pre-Study Complaints

- Difficulty going to sleep
- Wake up 2-3 times a night for last 3 years
- Muscle cramps in legs
- Chronic muscle pain through-out body (myofacial)
- Hot flashes

End of Study Reports

- "Fall asleep faster and easier"
- "My neck pain is lessened"
- "My leg and foot cramps have lessened"
- "Arm and lower back pain were gone by the very first week"
- "TMJ problem significantly improved"
- "Reduction in hot flashes"

Female age 24 – Menstrual cycle regular

Pre-Study Complaints

- Trouble sleeping for 17 years; takes a long time to fall asleep; wake up after several hours and can't sleep again; wake up exhausted
- Daily headaches
- PMS: migraines one week before period
- Menstrual cramps, mood swings, bloating, irritability, depression, weight gain, hot flashes
- Digestion: bloating, nausea, diarrhea, gas, constipation

End of Study Reports

- "By the third night, decreased time to go to sleep and slept through the night"
- "Able to fall back asleep within a few minutes after waking up and no more nightmares"
- "Wake up refreshed instead of exhausted"
- "No more daily headaches"
- "Re: PMS – decreased food cravings, bloating, depression and hot flashes"
- "Digestion improved with less bloating, constipation and nausea"

Female age 52 – Post Menopausal

Pre-Study Complaints

- Sleep very lightly
- Wake up feeling tense several times during the night
- Wake up feeling tired in morning; feel tired all day
- Pain in left hip, sporadic for several years
- Allergies (food and airborne) since age 13
- Digestion: gas

End of Study Reports

- "Have felt more rested and feel like I need an hour less sleep per night"
- "Deeper relaxation"
- "Stopped having any pain at all in my left hip"
- "First few days, I experienced tingling and heat in areas of my previous physical injuries – similar to an acupuncture treatment. After approx. 3 days, these vague feelings subsided"

- “Allergies have definitely lessened”
- “Better digestion”
- “I noticed that I stopped clenching my jaw at night”

Female age 42 – Menstrual cycle regular

Pre-Study Complaints

- Trouble falling asleep; light restless sleep
- Waking feeling tired; also, trouble waking up from naps
- Fibromyalgia since 1992 car accident; a lot of joint pain – arms, legs, ankles
- Gastrointestinal upset - gas

End of Study Reports

- “The general quality of my sleep improved – not immediate, but a gradual change”
- “Sleeping much deeper”
- “A lot less fatigue because of less pain”
- “My fibromyalgia has improved considerably because of diminished pain and fatigue; the joint pain is gone with occasional pain in the left arm”
- “I am feeling much better, I haven’t been sick at all”

Female age 44 – Menstrual cycle regular, periods heavy

Pre-Study Complaints

- Trouble sleeping; wake up 2-3 times each night with physical discomfort
- Numb fingers left hand 4 months, carpal tunnel
- PMS: bad cramps, painful heavy periods and uterine fibroids many years, breast tenderness, mood swings, weight gain
- Hot flashes at night [or may be night sweats]
- History of anxiety attacks

End of Study Reports

- “Gradually sleeping better”
- “Two episodes of waking up between 4:30-5:30 AM with anxiety that subsides by early afternoon.
- “Less numbness in hand and fingers, especially at night; not needing to wearing a brace at night”
- “Menstrual period not as severe; cramps not as strong”
- “Feeling better physically and emotionally”

Female age 51 – Post Menopausal (last period one year ago)

Pre-Study Complaints

- Some trouble falling asleep
- Wake up from hip pain; also wake up from a hot flash between 4 and 5 AM
- Wake up with a headaches every morning (last 3 months)
- Wake up tired and feeling groggy (last 3 months)
- Hot flashes all day (for one year) as well as during sleep
- Hip pain, possible arthritis (1-2 years)

End of Study Reports

- “Disappointed that I did not sleep any better”
- “No significant change except for less occurrence of hot flashes”

Female age 31 – Irregular menstrual cycle; period ceased for one year and restarted 3 weeks prior to study start date, then ceased again during study

Pre-Study Complaints

- Problems getting to sleep
- Trouble sleeping, discomfort from neck, toss and turn till 3AM
- Feel unrested in the morning
- PMS: bloating, breast tenderness, weight gain, acne (during menstrual periods)
- Allergic to some foods (last 2 years)
- Digestive problems: gas, constipation, bloating, heartburn

End of Study Reports

- “At first my body responded quickly by feeling completely relaxed. But due to stress (planning my wedding) I then went through several weeks of soreness in my neck. But I’ve noticed I sleep a lot more comfortably overall than I have in the past couple of years.”
- “Deeper relaxation once I get to sleep”
- “Digestive system is getting better...less stomach pain and bloating”

Female age 50 – Menstrual cycle regular

Pre-Study Complaints

- Trouble falling asleep since childhood
- Trouble waking up; fatigue
- Muscle aches and leg cramps – many years
- Lower back pain and intestinal pressure due to uterine fibroids
- PMS: fibrocystic breast tenderness, bloating, cramps, irritability, mood swings, food cravings
- Night sweats
- TMJ causing occasional headaches

End of Study Reports

- “Less stress about going to sleep after a lifetime’s worth of sleep disorders”
- “Somewhat less trouble falling asleep
- “Have gradually woken up feeling more refreshed whereas I almost always felt fatigued”
- “Leg cramps almost completely gone”
- “Less backache and pain”
- “Less PMS and even less fibrocystic; less cramps and irritability with PMS”
- “More even-tempered and greater sense of well-being; a low-grade, background feeling of stress I’ve always had seems to be diminished”
- “TMJ greatly reduced”

Summary

The evidence presented in this paper demonstrates that grounding the human body to earth reduces chronic inflammation and related chronic pain

Due to the modern day loss of natural grounding (wearing synthetic soled shoes and living in environments that insulate the body from the earth), exposure to 50-60 Hz electric fields creates measurable induced voltage in the body. This unnatural voltage consists of electrons of the body that are “held hostage” during exposure and held away from their normal functions. In effect, this creates a shortage of electrons in the body in terms of normal functioning. This results in increased free radical levels that promote chronic inflammation (oxidative stress) and related chronic pain. Grounding the human body to earth shields it from environmental electric fields and restores the body’s natural bio-electrical homeostasis.

Research findings support this conclusion, as follows: when the human body is grounded (1) induced body voltage is significantly reduced; (2) cortisol, a well-known biomarker for stress and inflammation, normalizes; (3) test subjects experience a significant reduction in chronic inflammation and related chronic pain; and, (4) current research (see reference list below) confirms that exposure to environmental 50-60 Hz electromagnetic fields increases free radicals and lengthens their life span in the body.

Additional studies are now underway at the California Institute for Human Science to further identify and quantify the physiological effects of grounding the body to the earth. These findings will be reported when available.

FAQs - Frequently asked questions regarding personal grounding

Q. Can I ground myself to a home electrical outlet ground or to a water pipe?

A. No! Personal ground systems must be connected directly to the earth. All home electrical ground systems and water systems to which they are bonded carry measurable induced voltage

from adjacent hot wires. In reference to earth, induced voltage measured on water systems and electrical ground systems averages 400+ millivolts AC. Further, these ground systems also conduct transient fields from the grid and associated home electrical systems and appliances.

Q. At work I wear a grounded ESD bracelet. Does that produce the same grounding effect?

A. Conventional ESD bracelets are primarily used for dissipating static electricity created on a person's body (from clothing and synthetic materials) to prevent damage to sensitive electronic components. During preliminary investigation, we tested these products for use in our studies and found the 1 Meg resistor, built into existing ESD ground cords, prevents 60 Hz electric field induced body voltage from dropping below 300-400 millivolts AC. In our studies we found the most beneficial health results of grounding were achieved at levels below 10 millivolts. We could only reduce AC induced body voltage below that level with the use of a 10 mA fuse.

[To measure 60 Hz electric field induced body voltage, place a ground rod in the earth and run a ground wire into bedroom, connect to voltmeter set on AC. Lie down on bed, make skin contact with positive lead (at any point on body, EKG electrode patch can be used for skin contact.), reading will display 60 Hz electric field induced body voltage. To measure effects of grounding body with a conventional ESD bracelet, run a second ground wire from the earth and connect it to the ESD bracelet coil cord and place bracelet on arm. Lie down in same location and re-measure body voltage. Reading will show that 1 Meg resistor holds induced voltage on the body. Remove bracelet/coil cord and ground body directly, induced body voltage will measurably drop to near zero in reference to the earth.]

Q. What about protection from an electrical event?

A. In the medical and electro-static discharge (ESD) industries, there are well-established guidelines for personal grounding safety. Those guidelines, used for protection from an electrical event, are incorporated into the devices used in the above studies. The electrode patch and conductive mattress pad ground systems contain inline UL approved 10 mA fuses. The conductive wire used in ground systems is a 10-strand tinsel RFI configuration with an aggregate 20-gauge surface rating. The grounded conductive top fabric of the bed pads is constructed using dissipative carbon fibers with a 1×10^5 surface resistance. This means the conductive carbon fibers dissipate charge at a rate of approx. 2.5 mA, or less, which is 4 x lower than fuse rating.

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