



Research on Grounding - 20 Published Studies

There is a growing amount of published research on grounding for health in peer-reviewed journals.

Most of this research is written in technical language that can be hard to understand. To make-it-easy, we've created short summaries that introduce the aim of the study, what was done and what the results were. We've included a link to study so you can go back to the source too.

Browse by health topic below including research on sleep, blood circulation, pain and muscle soreness, stress, immune response and more.

<u>Sleep</u>	<u>Stress</u>	<u>Immune</u>
<u>Blood Circulation</u>	<u>Pain & Muscle Soreness</u>	<u>Inflammation</u>
<u>EMFs</u>	<u>Other Measurable Changes</u>	

Or start with this following review article that briefly summarizes nine earlier studies (2000-2015) that look at the effects of grounding on sleep, chronic pain, stress and more: [Earthing: Health Implications of Reconnecting the Human Body to the Earth's Surface Electrons](#)

In conclusion, the authors state that "earthing may be a simple, natural, and yet profoundly effective environmental strategy against chronic stress, ANS dysfunction, inflammation, pain, poor sleep, disturbed heart rate variability, hypercoagulable blood and many common health disorders, including cardiovascular disease.

Sleep

1. The biologic effects of grounding the human body during sleep as measured by cortisol levels and subjective reporting of sleep, pain, and stress

Journal of Alternative and Complementary Medicine, 2004;10 (5):767–776. Ghaly M, Teplitz D. (Full text available).

Summary:

The aim of this study is to determine the biological effects of earthing in the body during sleep by measuring the cortisol levels and the circadian cortisol secretion profile within an eight-week period. The pilot study recruited 12 subjects with sleep dysfunction, stress and pain complaints.

Before the start of the study, the participants were administered saliva tests to establish the pre-grounding baseline for cortisol levels, They were also asked to self-administer saliva tests every four hours for a 24-hour period to determine their pre-grounding circadian cortisol profiles.

During the test period, subjects were asked to complete daily surveys after sleeping in their own beds with a grounded or earthed mattress pad. Cortisol tests were repeated at week six.

After the eight-week period, the results showed a significant reduction of cortisol levels in the subjects during the night and were higher during the day, indicating that earthing or grounding the body to the earth helps re-synchronise cortisol secretion so that it aligns with the natural circadian rhythm profile.

Furthermore, the participants reported an improvement in sleep quality, a reduction in pain and stress with earthing overnight.

Blood Circulation

The following five studies look at grounding and blood circulation.

2. Grounding Patients With Hypertension Improves Blood Pressure: A Case History Series Study, 2018.
3. Earthing (grounding) the human body reduces blood viscosity—a major factor in cardiovascular disease, 2013.

4. One-Hour Contact with the Earth's Surface (Grounding) Improves Inflammation and Blood Flow – A Randomized, Double-Blind, Pilot Study, 2015.
5. Grounding the Human Body Improves Facial Blood Flow Regulation: Results of a Randomized, Placebo-Controlled Pilot Study, 2014.
6. Grounding the Human Body during Yoga Exercise with a Grounded Yoga Mat Reduces Blood Viscosity, 2015.

2. Grounding Patients With Hypertension Improves Blood Pressure: A Case History Series Study

Alternative Therapies in Health and Medicine 2018 Nov; 24(6): 46-50.
Elkin HK, Winter A. (Abstract Only)

Summary:

This pilot study consists of case studies following 10 patients of cardiologist Howard K Elkin. The participants were male and female, of different ages, with different degrees of hypertension (high blood pressure).

Each participant was provided with grounding products and asked to ground at home for 10 hours per day using grounding bedding at night and a grounding mat during the day for a minimum of 12 weeks.

Following a baseline reading, their blood pressure was measured monthly at the clinic. Additionally, each participant was given a Blood Pressure Monitor and asked to record their blood pressure on Mondays, Thursday and Saturdays at 8am and 8pm for 12 weeks.

By the end of the 12-weeks all ten patients had significantly improved blood pressure levels, with systolic levels reducing by an average decrease of 14.3%. Additionally, all patients reported experiencing one or more of the following benefits: better sleep, more calmness, and fewer aches and pains. The study concludes that "grounding could represent a safe, simple and effective lifestyle strategy for reducing blood pressure in patients with mild to moderate hypertension who wish to avoid pharmaceutical drugs". A larger study is warranted to fully explore this.

3. Earthing (grounding) the human body reduces blood viscosity—a major factor in cardiovascular disease

Journal of Alternative and Complementary Medicine, 2013, Volume 19 (2). 102-110. Chevalier G, Sinatra ST, Oschman JL, Delany RM. (Full-text available)

Summary:

The aim of the study is to determine the effects of grounding for two hours on red blood cells (RBCs). Ten healthy participants were grounded using conductive patches on their hands and feet while comfortably reclining on chairs inside a dimly lit, soundproofed room.

The conductive patches were wired into stainless steel rods planted into the ground outside. Blood samples were taken from each subject and were analysed through a microscope to check the zeta potential (a measurement for electrical charge particles suspended in the blood) and the RBC aggregation before and after grounding.

Eighteen measurements for each subject were tracked over the course of the study. After two hours of grounding, the data for each subject revealed an increase in zeta potential and a decrease in RBC clumping.

This result means there is less likelihood of clumping and clogging in the blood, suggesting that grounding can be used as a strategy to support the cardiovascular system. Efficient blood flow is important in delivering oxygen and nutrients all throughout the body and reduces the risk of hypertension.

4. One-Hour Contact with the Earth's Surface (Grounding) Improves Inflammation and Blood Flow – A Randomized, Double-Blind, Pilot Study

Health, 2015, 7 (8), 1022-59. Chevalier G, Melvin G, Barsotti T. (Full text available).

Summary:

The objective of this study is to determine the effects of one-hour of grounding on blood circulation, especially in the face. Forty middle-aged volunteers were recruited to participate. For the double-blind procedure, the subjects were randomly selected into two groups, the grounded and sham-grounded.

Each group sat in a comfortable recliner chair equipped with a grounding pillow, and grounding mat, and conductive patches connected to conducting wires that went into the ground port of an electric power outlet. The cord connecting the port to the grounding products had a built-in resistor for surge protection.

Thermal imaging, taken by an infrared camera, was used to measure body temperatures and changes in the blood flow.

For the experiment, the participants underwent thermal equilibration for 15 minutes to normalise their body temperature. Next, the participants were asked to sit on the recliner chair in a 30-degree angle with the grounding equipment in place and a patch placed on each sole and palm. The subjects were given 10 minutes to relax before the 1-hour grounding (or sham-grounding) session began. After this, post-session thermal imaging was taken.

The result of the thermal image scan showed improvements in fluid movement in the abdomen and blood circulation in the face for the grounded subjects. Based on the findings, it appeared that one-hour of grounding promoted autonomic nervous system control of body fluids as well as peripheral blood flow that may result in better blood circulation in the face and throughout the torso. grounding may also help with skin health, vitality, facial tissue repair and enhance facial appearance and may translate to better health, according to this study.

5. Grounding the Human Body Improves Facial Blood Flow Regulation: Results of a Randomized, Placebo-Controlled Pilot Study

Journal of Cosmetics, Dermatological Sciences and Applications, Dec 2014, vol 6 No 5: 293-308. Chevalier, G. (Full text available).

Summary:

The aim of this double-blind pilot study is to assess if one hour of grounding can generate measurable changes in facial blood flow. For this pilot study, 40 participants were recruited and assigned randomly to either the grounding group or sham-grounding group.

The grounding equipment used for this study consisted of transcutaneous electrical nerve stimulation (TENS) patches, conductive mats and pillows. The conducting wires in these materials were connected to a power outlet ground port. For sham-grounding, the grounding system was modified to prevent conduction from the earth.

A Laser Speckle Contrast Imaging (LSCI) camera was used to document real-time, high-resolution videos of the blood flow changes in the face.

The subjects were tested individually for the experimental procedure. They were instructed to sit on a comfortable recliner chair equipped with grounding mats and pillows, and the patches were placed on each of their soles and palms. The switch was flipped on to begin either grounding or sham-grounding them for one hour.

Facial blood flow images were taken 20 minutes after the grounding session began, and additional sets of images after the subjects reached their highest point or peak after the relaxation period.

The results of this pilot study showed improvement in facial blood flow regulation in the subjects in the grounded group only. All grounded subjects experienced either an increase in blood flow sometimes with a fluctuating rhythm. By comparison in the non-grounded group, facial blood flow decreased or remained constant at a low value with no rhythmic fluctuation. The clear difference between the groups shows that even one hour of grounding restores blood flow to the face. Improved blood flow may enhance skin tissue repair, skin health and vitality, and improve facial appearance.

6. Grounding the Human Body during Yoga Exercise with a Grounded Yoga Mat Reduces Blood Viscosity

Open Journal of Preventive Medicine Vol.05 No.04(2015), Article ID:55445, 9 pages. Brown. R, Chevalier. G. (Full text available).

Summary:

The aim of this double-blind research study is to determine whether the benefits of grounding extend to people practising a gentle form of Hatha yoga on a grounded yoga mat for one hour.

Any form of exercise, even gentle yoga can result in an inflammatory response by the body. This leads to an increase in Reactive Oxygen Species (ROS) and Reactive Nitrogen Species (RNS). These highly reactive molecules can attract negatively charged electrons away from other molecules and cells. In the case of red blood cells, this mechanism was expected to decrease their negative charge and increase blood viscosity.

Blood viscosity is a measurement of the thickness and stickiness of blood which affect its ability to flow freely through the vessels. Having high blood viscosity has been linked with a number of chronic diseases including high blood pressure, cardiovascular disease, diabetes and Alzheimer's disease.

For the study, 28 non-pregnant female subjects between the ages of 35 and 65 were recruited. These women were all either just beginning or just about to begin practising yoga but were not experienced. They had body mass indexes ranging between 25.1 and 31.4.

The study was carried out over the course of two days with 14 subjects being tested on each day. Of the 14 yoga mats used, half were grounded to earth and the other half were sham grounded. The subjects selected their own mats at random, unaware of whether their chosen mat was genuinely or sham grounded.

They performed one hour of yoga exercises in 5 x 12 minute sections with one minute's rest in between. The subjects' blood was taken before and after the exercise and tested using a Hemathix Blood Analyzer SCV-200. This state of the art piece of equipment enables standardized testing of blood viscosity.

The results showed that the 14 women who performed yoga on the grounded mats had a significant reduction in both systolic and diastolic blood viscosity after just one hour. The women in the sham grounded control group did not experience this decrease. In fact, the ungrounded women had a slight but insignificant increase in blood viscosity following the exercise.

These results indicate that grounding during exercise could be an effective way to reduce inflammation and blood viscosity, along with all of its associated health risks.

Pain, Muscle Soreness & Exercise Recovery

The following four studies look at how grounding or grounding can effectively help reduce inflammation and pain, lessen muscle damage and speed up recovery from injury.

7. Effectiveness of Grounded Sleeping on Recovery After Intensive Eccentric Muscle Loading, 2019.
8. Pilot study on the effect of grounding on delayed-onset muscle soreness, 2010.
9. Grounding after moderate eccentric contractions reduces muscle damage, 2015.
10. Clinical Earthing Application in 20 Case Studies (unpublished)
11. Differences in Blood Urea and Creatinine Concentrations in Earthed and Unearthed Subjects during Cycling Exercise and Recovery, 2013.

7. Effectiveness of Grounded Sleeping on Recovery After Intensive Eccentric Muscle Loading

Frontiers in Physiology, January 2019. Muller E et al. (Full text available).

This university study looked at the effect of sleeping grounded over 10 days with respect to recovery from muscle soreness and post-intensive eccentric exercise athletic performance

Twenty-two healthy participants were recruited and each did 20-minutes of intense downhill treadmill running, an exercise that was chosen because it produces long term muscle soreness and muscular fatigue. Then, by random selection, 12 participants slept overnight on grounding bedding and 10 participants were sham grounded overnight (their cord was modified so participants were unaware whether they were grounded or not).

Testing took place before the exercise (to establish a baseline) and then post-exercise on days 1,2,3,5,7 and 10. It included testing for participant's perception of their muscle soreness, their creatine kinase blood levels (CK), maximum voluntary isometric contraction (MVIC) for both legs, and their ability to perform a countermovement jump and drop jump. Four participants were selected for detailed analysis of blood counts and serum-derived inflammation markers.

Results for the grounded group showed faster recovery, less pronounced markers of muscle damage, and less inflammation.

Blood testing showed that muscle damage associated inflammatory markers like IP-10, MIP-1a and sP-Selectin were lower in the grounded group compared to the ungrounded group. The grounded group also had a lower post exercise increase of Creatine Kinase (an enzyme used to test inflammation) than the ungrounded group. Creatine Kinase is a muscle protein that releases into the bloodstream post exercise and is associated with DOMS or Delayed Onset Muscle Soreness.

There was also a marked difference between the concentration and type of red blood cells (haemoconcentration). The grounded group showed no change whilst the ungrounded group had a significant increase during days 2-7. The researchers hypothesized that the earth's mobile electrons were preventing or diminishing inflammation, and this could also be one reason for the unaffected hemoconcentration as well as the dampened Creatine Kinase response. Usually post-exercise haemoconcentration is triggered by water loss. However results from this preliminary study suggest that sleeping grounded might prevent the phenomenon of haemoconcentration via the reduction of blood viscosity and improved blood circulation. Further research is warranted to better understand how grounding causes the regeneration of muscles at a cellular and molecular level.

8. Pilot study on the effect of grounding on delayed-onset muscle soreness

Journal of Alternative Complementary Medicine, 2010 Mar; 16 (3): 256-73. Brown D, Chevalier G, Hill M. (Full text available).

Summary:

The purpose of this study is to determine markers that can warrant further studies on the effects of grounding on delayed-onset muscle soreness (DOMS).

Eight healthy subjects were recruited to participate in this pilot study. All participants did a specific calf exercise to cause DOMS in the gastrocnemius muscles in the legs. By random selection, four subjects were grounded overnight on grounding bedding. In addition, grounding patches were placed on gastrocnemius muscles and on the bottom of

their feet. The other four subjects received the same treatment except their grounding systems were modified to prevent connection to the earth.

At the end of the study, blood markers and enzymes were measured and compared. Parameters showed that grounding changed immune system activity, which helped in pain relief and speedy recovery from DOMS.

9. Grounding after moderate eccentric contractions reduces muscle damage

Open Access Journal of Sports Medicine, 2015. Brown R, Chevalier R, Hill M. (Full text available).

Summary:

The aim of this follow-up study is to determine the effects of grounding on muscle soreness using self-reporting on pain, and measures of creatine kinase (CK) and complete blood count. Creatine Kinase (CK) is an enzyme used in tests on inflammation of muscles.

Thirty-two healthy young men were recruited to participate in this study and were randomly selected for the grounded group and sham-grounded group.

On Day 1 and 2, the participants were given a five-minute warm-up and another five minutes for instructions. The subjects then proceeded to perform knee bends for 10 minutes. Then the participants proceeded to do a grounding or sham-grounding session for four hours. They were seated in a room while grounding patches were placed on their quadriceps and they placed their bare feet on grounding mats. The sham-grounded group were not aware that their products were not grounded properly. All participants were permitted to eat, drink, and use electronic devices for the duration of the grounding period.

Testing continued on days 3 and 4 with blood monitoring and grounding, but no exercise. The participants grounded for 8 hours over the test period.

Muscle inflammation (CK levels) significantly increased in the sham-grounded subjects, but CK did not increase significantly for the grounded subjects. On Day 2 there was a big difference between the two groups. On Day 3, the CK levels of both groups returned to their pre-exercise amount. grounding reduced the loss of CK from injured muscles, which indicates a healing effect.

However, there was no difference in self-reported pain between the two groups, maybe because all participants were fit, active, healthy and used to regular exercise.

Laboratory tests demonstrated differences in blood markers. The number of neutrophils (a type of white blood cell) in the blood were statistically significant. Neutrophils are the white blood cells that get inflammation started (pro-inflammation action) and then wind it up later (anti-inflammatory action). On day 2 the grounded groups had an increase in neutrophils, whilst the non-grounded group had a decrease. On day 3, both groups were almost back to day 3 values. Further research is needed to properly understand how grounding affects neutrophils and how it impacts inflammation.

10. Clinical Earthing Application in 20 Case Studies

Amalu, W. President of the International Academy of Clinical Thermography. Unpublished study.

Summary:

The aim of this study is to examine the clinical applications of grounding using medical thermography. Medical thermography is a technique which can be used to view areas of inflammation and assess blood circulation within the body. Inflammation and poor circulation can both contribute to a wide variety of conditions including acute and chronic pain.

The study is presented in the form of 20 case studies which were carried out during 2004 and 2005. All of the subjects were selected at random from a database as they presented for care at an out-patient clinic treatment centre in Redwood City, California.

The subjects were suffering from a range of different conditions. Eight of the participants presented with back, neck and/or shoulder pain. Six presented with leg and/or knee pain. Four presented with ankle and/or foot pain. One subject suffered from severe cold feet and one had an unhealed ankle wound. Some of the subjects were also suffering from poor sleep due to their painful conditions.

Some of the subjects were provided with grounding sheets. This consisted of bedding containing conductive fibres, which was placed on top of the subject's mattress and connected to the earth via a conductive ground cord and a ground rod.

Other subjects were given clinical grounding treatments. These entailed the use of conductive electrode adhesive patches that were attached to the skin at specific points and grounded to earth via a conductive wire that was connected to an earthed ground rod. One clinical grounding session lasted a total of 30 minutes.

High resolution medical infrared imaging was used to assess both inflammation and circulation in all subjects both before and after grounding. The subjects also rated their pain symptoms subjectively using a four point visual analogue scale.

Each subject's condition was monitored over the course of several weeks and the results recorded.

The thermal imaging showed that grounding provided significant changes in both acute and chronic inflammation and improved circulation. The subjects all also reported a reduction in their pain levels and improved sleep.

The subjects using the grounding sleep system often reported relief after just a few days of sleeping grounded to earth, and that the benefits increased with increased time sleeping on the conductive bedding. Those who underwent clinical grounding often experienced benefits immediately after just one 30 minute session.

The researcher concluded that grounding shows "incredible promise" in the treatment of both acute and chronic inflammatory conditions.

11. Differences in Blood Urea and Creatinine Concentrations in Earthed and Unearthed Subjects during Cycling Exercise and Recovery

Evidence-Based Complementary and Alternative Medicine, Volume 2013 (2013). Sokal P. (Full text available).

Summary:

The purpose of this Poland-based study was to determine the biochemical changes in humans while grounding during physical exertion and recovery, with the measurements focused mainly on blood urea and creatinine concentrations.

Forty-two (42) male volunteers were recruited for this double-blind experiment and were divided into two groups, Group A and Group B. In the first week of the study, subjects in Group A were grounded while participants in Group B were ungrounded. The test methods were switched for both groups in the second week, wherein the subjects in Group A were ungrounded, and volunteers for Group B were grounded

The grounding equipment used for the study consisted of four meta-plastic hypoallergenic bands, which was wrapped around the subject's leg at the start of the trial. These bands were attached to conductors with a terminator clamp placed on a plumbing pipe. The bands were fitted with a cable that allowed the grounding system to be switched off for the sham-grounded group.

For the study, the participants performed two training exercises, each for 30 minutes, on a bicycle ergometer, once while grounded and the other session while sham-grounded. The session consisted of 30 minutes of training and 40 minutes of recovery.

Research coordinators measured the electrical potential of each volunteer's body as well as blood parameters. Blood samples from each subject were obtained before and after the test session, during the 15th minute after exercise, 30th minute after exercise, and the 40th minute within the recovery phase. During training, continuous monitoring of physiological parameters was performed

Test coordinators used an A-15 analyzer to perform a biochemical analysis. Measurement for urea concentrations were done using enzymes with urease and glutamine dehydrogenase. The kinetic calorimetric technique with alkaline picrate was used to measure the creatinine levels.

The results of the experiment showed that grounding during exercise aids metabolism by balancing proteins.

Protein metabolism was enhanced when the subjects were grounded during exercise, creating a positive nitrogen balance. Substantially low levels of blood urea was documented for grounded subjects during exercise and relaxation sessions. Although creatinine concentrations did not change during exercise, grounded participants had lower levels after 40 minutes of recovery in the second week.

The study concluded that grounding may have a significant effect on health in rest and exercise, particularly on training athletes.

Stress and Mood

The following four studies measure the effect of grounding on the autonomic nervous system which is responsible for calming us as well as our fight-or-flight reflex.

12. Emotional stress, heart rate variability, grounding, and improved autonomic tone: clinical applications, 2011.
13. Changes in pulse rate, respiratory rate, blood oxygenation, perfusion index, skin conductance, and their variability induced during and after grounding human subjects for 40 minutes, 2010.
14. The Effect of Grounding the Human Body on Mood, 2015.
15. Electrical Grounding Improves Vagal Tone in Preterm Infants, 2017.

12. Emotional stress, heart rate variability, grounding, and improved autonomic tone: clinical applications

Integrative Medicine: A Clinician's Journal, 2011;10 (3). Chevalier G, Sinatra S. (Full text available).

Summary:

This study looked at the effects of grounding on the body's heart rate variability (HVR), stress, and autonomic tone (health of the nervous system).

Heart rate variability is an indicator of acute and chronic stress relating to mental load, anxiety or emotional trauma.

Twenty-eight healthy subjects participated in the study. grounding patches were placed upon each person's palm and on the soles of each foot and connected to a grounding rod outside via an intermediary box with a switching mechanism.

The participants were asked to sit for two hours on a comfortable reclining chair, during which they spent 40-minutes not grounding, 40-minutes grounding, and a further 40-minutes grounding. For the duration of the two-hour session, the subjects were asked to relax and rest. Sleep was permitted, but meditation was not allowed.

The HVR parameters were calculated from electrocardiogram (ECG) recordings during the study.

The results showed an improvement in the balance between the sympathetic and parasympathetic nervous systems. The study concluded that "grounding has the potential to help support HRV, reduce excessive sympathetic overdrive, balance the autonomic nervous system and attenuate the stress response." In patients who experience anxiety, emotional stress, panic, fear or symptoms related to autonomic nervous system damage (such as headaches, dizziness and heart palpitations), the researchers suggested that grounding could have a positive effect within 20 to 30 minutes.

13. Changes in pulse rate, respiratory rate, blood oxygenation, perfusion index, skin conductance, and their variability induced during and after grounding human subjects for 40 minutes

Journal of Alternative and Complementary Medicine, 2010 Jan; 16 (1): 81-7. Chevalier G. (Abstract only)

Summary:

This double-blind study looked at the physiological effects of grounding on 28 healthy subjects, 14 and 14 women.

The researchers used several devices for recording and data processing including a Radical-7 device to record the subject's pulse rate, blood oxygenation and perfusion index. This device used a signal extraction technology, which used more than seven

wavelengths of light to obtain data for blood constituents. The probe was placed on the middle finger of the subjects' hands.

A ProCom5 Inifiniti encoder was used to measure skin conductance and respiratory rate in real-time. The subject's ring and little fingers of the left hand were used to measure skin conductance. A respiration sensor was used to record respiratory rate, which consisted of a sensitive girth sensor fitted with a durable latex rubber band and self-adhering belt that can be worn in the thoracic section of the body over clothes.

Four transcutaneous electrical nerve stimulation (TENS) type adhesive grounding patches were used for the experiment, one for each palm and sole of the subjects. These patches were connected to ground rod outside ground via two intermediary boxes, one of which was fitted with a switch to connect or disconnect contact with earth.

For the duration of the experiment, the participants were asked to sit on a comfortable reclining chair. grounding patches were placed on the hands and feet. At the start of the session, the subjects remained seated for 40-minutes for sham grounding. After which, the switch was flipped on for 40-minutes of grounding session. The subjects spent another 40-minutes with the grounding system switched off, spending a total of two hours.

The findings of this experiment verified the hypotheses that skin conductance decreases shortly after grounding and increased immediately after ungrounding. Skin conductance is an established measure of autonomic nervous system function. The rapid drop in skin conductance (within 0.5-4 seconds) suggests that the calming mode of the nervous system (parasympathetic) was activated almost immediately when grounding.

Changes in respiratory rate, blood oxygenation warrant further research, especially when combined with skin conductance changes.

14. The Effect of Grounding the Human Body on Mood

Psychological Reports: Mental & Physical Health, 2015 116 (2): 534-42.
Chevalier, G. (Abstract only).

Summary:

This pilot study investigated whether grounding can help improve mood. The study involved 40 participants who were randomly selected and assigned to two groups, the grounding group and sham-grounding (control) group.

The grounding materials used for the study were conductive pillows, mats, and transcutaneous electrical nerve stimulation (TENS) patches. The wires from these pieces of equipment were attached to a connector on one end. A single wire was connected

from the other end, which was inserted into the ground port of a power outlet. The grounding equipment was outfitted with a switch that when switched on would connect to the ground.

For the double-blinded procedure, each participant filled out a Brief Mood Introspection Scale (BMIS) form before the start of the session. Each subject was then directed to sit on a comfortable reclining chair equipped with grounding pillows and mats, and a patch was attached to each of the participant's sole and palm.

Each subject was given 10 minutes to relax on the recliner chair before the switch was flipped on either for grounding or sham-grounding session for one hour. During the session, the participants were told to relax while the light was dimmed for maximum relaxation. At the end of the grounding session, the participants filled out another BMIS form.

The results of this pilot study supported three of the four hypotheses. First, the result showed a significant increase in the pleasant-unpleasant mood scale from the grounded group, indicating a more pleasant mood after grounding. Second, there was marked increase in the positive-tired mood scale, which indicated that the subjects in the grounded group felt less tired and more positive. Third, there was a significant decrease in the negative-relaxed mood scale, which demonstrated that participants in the grounding group were less negative and more relaxed.

The conclusion of the pilot study was that grounding for one hour can improve mood, suggesting that walking barefoot or using a conductive material has the potential positive effect on health. The results warranted further study on a larger scale with more psychological and physiological tests.

15. Electrical Grounding Improves Vagal Tone in Preterm Infants

Neonatology 2017;112(2):187-192. doi: 10.1159/000475744. Epub 2017 Jun 10. Passi. R, Doheny. K.K, Gordin. Y, Hinssen. H, Palmer. C.

Summary:

The aim of this study is to measure the strengths of electrical fields within the environment of the neonatal intensive care unit (NICU), and determine whether grounding can reduce skin voltage and improve vagal tone in preterm infants.

Preterm infants are at an increased risk of health problems due to the immaturity of their internal organs. One particularly serious threat to preterm babies is necrotizing enterocolitis, a potentially fatal disease of the intestines.

Preterm babies must spend time in the NICU to support them through the difficult first weeks of their lives. However, the electrical equipment used within the NICU can give off background electromagnetic fields which the researchers propose may cause these infants additional stress.

Emotional stress can be measured using heart rate variability (HRV), which is indicative of vagal tone. Good vagal tone indicates increased activity in the parasympathetic branch of the autonomic nervous system which is activated during rest and relaxation. Decreased vagal tone is associated with the activation of the sympathetic nervous system under stressful conditions.

Prior to the study, environmental magnetic flux density was measured in and around the incubators in the NICU. It was found to be higher inside the closed incubators, ranging between 1.5 and 12.7mG compared with just 0.5mG outside.

A total of 26 preterm babies, aged between six and 60 days old, were included in the study. 20 were measured for both skin voltage and HRV and the remaining six for skin voltage only. Measurements were taken before, during and after grounding. grounding was achieved using a patch electrode and wire extending to a ground outlet.

The results showed that prior to grounding, the infant's skin voltage was measured at 60Hz, the exact frequency of electrical power.

During grounding, the infants' skin voltage dropped by 95% and vagal tone improved by 67%. This indicates reduced levels of stress and increased relaxation. After grounding, the infants' vagal tone returned to its original levels.

These results suggest that grounding could be a valuable strategy for use in neonatal units. It may help not only to relieve stress in preterm infants, but also reduce the risk of disease and improve outcomes.

Inflammation and Immune Response

16. The effects of grounding (earthing) on inflammation, the immune response, wound healing, and prevention and treatment of chronic inflammatory and autoimmune disease

Journal of Inflammation Research, 2015, March 24. Oschman, James L, Chevalier G, Brown R. (Full text available).

Summary:

This is a report of accumulated research studies and experiences on the effects of grounding on wound healing, chronic inflammation and autoimmune disease prevention and/or treatment, and immune system response.

It reviews early studies on the effects of grounding such as Ghaly and Teplitz study which showed the normalisation of overnight cortisol levels in 12 subjects after sleeping on their own beds with an grounding mattress pad. It also reviews the pilot study Brown, Chevalier, Hill conducted about grounding and its effects on delayed-onset muscle soreness (DOMS). That study concluded that grounding can change immune system activity, and assist in recovering from an injury from DOMS.

It includes pictures of wounds that healed more rapidly with grounding, and offers a theory of how the earth's free electrons travel through the body to reduce inflammation.

It concludes that grounding is a simple and natural health strategy to fight against inflammation and support immune response.

17. Can Electrons Act as Antioxidants? A Review and Commentary

Journal of Alternative and Complementary Medicine, 2007, 13 (9): 955-967. Oschman, J. (Full text available).

Summary:

This review article looks at earlier research on grounding and its effects on the human body. It provides well-explained summaries of different studies by Ghaly, Teplitz, Chevalier, Mori, and Oschman. It is a great article to share with your doctor.

It suggests that free electrons from the earth act like natural antioxidants when they enter the body via the skin. In doing this they can help curb different kinds of inflammation, including chronic or long-term inflammation which contributes to many modern diseases – from arthritis to Alzheimers, eczema and more.

To better understand how grounding affects the body, Oschmann refers to the pioneering work of H. Selye who researched the relationship between inflammation and cortisol levels. His findings show that the adrenal cortex produces hormones to mediate and modulate the inflammatory responses. We know that grounding overnight (whilst sleeping) normalises overnight cortisol levels. This further supports the hypothesis that grounding can help relieve inflammation.

EMFs

There have been three published studies on how grounding the body changes the effect of EMFs.

Click on the name of the study to go to the summary.

18. Effects of Grounding on Body Voltage and Current in the Presence of Electromagnetic Fields, 2016.

19. Grounding the Human Organism Influences Bioelectrical Processes, 2012.

20. Electrical Grounding Improves Vagal Tone in Preterm Infants, 2013.

18. Effects of Grounding on Body Voltage and Current in the Presence of Electromagnetic Fields

Journal of Alternative and Complementary Medicine, 2016 Sep 22(9): 757-9. Brown R. (Abstract Only)

Summary:

The objective of this experimental study was to determine if grounding can produce harmful currents in the body while in the presence of electromagnetic fields (EMFs) in a normal housing environment. Note this study focuses on AC electrical EMFs not higher frequency EMFs from wi-fi or mobile phones.

The study tested 50 participants, a combination of men and women with ages between 12 and 79. The subjects were asked to touch a desk lamp with their left hands and then move the hand away from the lamp while testers measured their body voltage. The subjects were then grounded and asked to repeat the same movements. Body voltage was measured during the grounding test.

The results showed that alternating current (AC) body voltage decreased by an average of 58-fold when the subjects were grounded in comparison to when they were not grounded. The study concluded that AC electrical EMFs induced in the body are much lower when a person is grounding compared to not grounding.

19. Grounding the Human Organism Influences Bioelectrical Processes

The Journal of Alternative and Complementary Medicine, Volume 18, Number 3, 2012, pp. 229–234. Sokal. K, Sokal. P. (Full text available).

Summary:

The aim of this study is to investigate the effects of grounding on the electrical environment of the human body.

The body relies on electrical potentials to carry out many of its biological functions. The earth generates electrical and magnetic fields which can affect these processes when brought into conductive contact with the skin. This study consists of two experiments designed to test this phenomenon.

The first experiment was carried out on four subjects, two male and two female. They were tested lying down in an insulated room and connected to the earth via electrodes placed on the sole of the foot, tongue, teeth and nails. A conductive copper cannula was also used to measure the electrical potential of the blood. The electrodes and cannula were connected to copper grounding plates placed outside on moist earth.

Initial measurements were taken once the subject had been lying, ungrounded for five minutes. The grounding system was then switched on and further measurements taken after five minutes and then one hour of grounding. Once the grounding system had been switched off for five minutes, a final measurement was taken.

The results showed that grounding significantly lowered the electrical potentials at all four sites on the body surface and in the blood. This happened with immediate and general effect. After the grounding system was switched off, all measurements returned to baseline.

The second experiment was carried out on 12 subjects. It was performed on the first floor of a building, in a Faraday cage. The Faraday cage is designed to block any external electrical fields which might interfere with the results.

The subjects were grounded by means of a copper plate attached to their lower leg. This was connected to another copper plate placed outside on the wet earth.

Subjects were tested in both lying and standing positions and the electrical potentials measured by means of an electrode placed on the tongue.

When the subjects performed upwards and downwards movements while ungrounded, they caused the electrode to become polarized. This created a positive charge with upward movement and a negative charge with downward movement.

When the subjects repeated this movement while grounded to earth, the electrode on the tongue showed that this polarization was eliminated.

These results show that a direct connection with the earth has the ability to affect the body's electrical potential and may be able to influence many of our bioelectrical processes.

20. Electrical Grounding Improves Vagal Tone in Preterm Infants

Neonatology 2017;112(2):187-192. doi: 10.1159/000475744. Epub 2017 Jun 10. Passi. R, Doheny. K.K, Gordin. Y, Hinssen. H, Palmer. C. (Full Text Available)

Summary:

The aim of this study is to measure the strengths of electrical fields within the environment of the neonatal intensive care unit (NICU), and determine whether grounding can reduce skin voltage and improve vagal tone in preterm infants.

Preterm infants are at an increased risk of health problems due to the immaturity of their internal organs. One particularly serious threat to preterm babies is necrotizing enterocolitis, a potentially fatal disease of the intestines.

Preterm babies must spend time in the NICU to support them through the difficult first weeks of their lives. However, the electrical equipment used within the NICU can give off background electromagnetic fields which the researchers propose may cause these infants additional stress.

Emotional stress can be measured using heart rate variability (HRV), which is indicative of vagal tone. Good vagal tone indicates increased activity in the parasympathetic branch of the autonomic nervous system which is activated during rest and relaxation. Decreased vagal tone is associated with the activation of the sympathetic nervous system under stressful conditions.

Prior to the study, environmental magnetic flux density was measured in and around the incubators in the NICU. It was found to be higher inside the closed incubators, ranging between 1.5 and 12.7mG compared with just 0.5mG outside.

A total of 26 preterm babies, aged between six and 60 days old, were included in the study. 20 were measured for both skin voltage and HRV and the remaining six for skin voltage only. Measurements were taken before, during and after grounding. Grounding was achieved using a patch electrode and wire extending to a ground outlet.

The results showed that prior to grounding, the infant's skin voltage was measured at 60Hz, the exact frequency of electrical power.

During grounding, the infants' skin voltage dropped by 95% and vagal tone improved by 67%. This indicates reduced levels of stress and increased relaxation. After grounding, the infants' vagal tone returned to its original levels.

These results suggest that grounding could be a valuable strategy for use in neonatal units. It may help not only to relieve stress in preterm infants, but also reduce the risk of disease and improve outcomes.

Other Effects of Grounding on the Human Body

21. The effect of earthing (grounding) on human physiology Part 1

[European Biology and Bioelectromagnetics](#) Jan 31, 2006; 600 -621.
Chevalier. G, Mori, K, Oschman. J.L. (Full text available).

Summary:

The aim of this study is to determine the effects of grounding on both physiological and electrophysiological aspects of the human body.

In this double-blind study, 58 healthy subjects were recruited and randomly assigned to grounded (n=28) or sham grounded (n=30) groups. The subjects were seated in a comfortable recliner with a conductive grounding patch attached to the sole of each foot. This was connected to a ground rod.

For the sham grounded subjects, a fuse was replaced by a piece of plastic, thus breaking the connection with the earth. The subjects did not know whether they were grounded or sham grounded during the study.

The subjects relaxed, ungrounded for a total of 28 minutes before the grounding system was switched on. They then remained grounded (or sham grounded) for a further 28 minutes.

An I-410 biofeedback system manufactured by J & J Engineering was used to measure four different parameters.

Two electrodes were placed on the forehead to give electroencephalogram (EEG) readings. These are used to measure brainwaves and indicate the level of neuronal activity at any given time.

A further four electrodes were placed on the left and right trapezius muscles to measure surface electromyograms (SEMGs). These indicate levels of muscle activity or tension.

Blood volume pulse (BVP) and heart rate (HR) were measured via a photoplethysmograph placed around the middle finger of the left hand and secured with a Velcro strap. BVP is used to measure peripheral blood flow and has been linked to

balance between the sympathetic and parasympathetic branches of the autonomic nervous system.

Measurements were taken from the last 14 minutes of relaxing, ungrounded, and the first 14 minutes of being grounded. The results were taken from the 30 sham grounded subjects and 22 of the 28 grounded subjects as the remaining six had incomplete data sets due to a fault. The results showed that on commencing grounding, about half of the grounded subjects experienced an immediate change in EEG activity. This occurred on the left side of the brain, but the right side remained unaffected.

SEMG values changed in all of the grounded subjects on both the left and right sides of the trapezius muscles. Again, this happened almost instantaneously as grounding commenced.

Grounding reduced BVP in 19 of 22 grounded subjects and 8 of 30 ungrounded control subjects. This happened steadily throughout the grounding period. HR was unaffected.

The results of this study suggest that grounding has significant effects on the electrophysiology of the brain and muscles, and can influence the balance of the autonomic nervous system.

22. The effect of earthing (grounding) on human physiology Part 2: Electrodermal Measurements

Subtle Energies & Energy Medicine Volume 18: Number 3: Pages 11-34.
Chevalier. G, Mori. K. (Full text available)

Summary:

The aim of this double-blind study is to further explore the effects of grounding on various aspects of human physiology. It used a piece of equipment known as an Apparatus for Meridian Identification (AMI). The AMI was designed by Dr Motoyama to measure energy transfer in the meridians as identified by traditional Chinese medicine theory, and their corresponding organs.

The device is attached to the Jing-Well points, located on the fingers and toes, and gives three readings; Before polarization (BP), after polarization (AP) and integral electrical charge (IQ).

According to Motoyama, BP can be used to measure inflammation and water levels in the meridians. An increased BP is indicative of inflammation and a low BP indicates dehydration. When no inflammation is present, a higher BP is thought to indicate a good state of health in the internal organs.

AP is used to measure the stress levels of each individual organ and IQ reflects the homeostatic function of the entire body, particularly immune function.

58 healthy subjects were recruited for the study. 28 of these subjects were grounded by means of a conductive electrode attached to the sole of each foot, in the region of the acupoint Kidney 1. This point is thought to be particularly effective at conducting the free electrons provided by grounding into the body. The electrodes were connected to the earth via a wire attached to a stainless steel ground rod driven into the soil outdoors.

The 30 subjects in the control group were sham grounded. They had the same electrodes attached to the soles of their feet, but a fuse was replaced by a piece of plastic. This interrupted the conductive connection with the ground rod.

The subjects were randomly assigned to one of the two groups and were unaware of whether they were grounded or sham grounded during the study.

The study consisted of five phases; Buffering (resting, pre-baseline phase), baseline 1, baseline 2, intervention 1 and intervention 2.

Excluding the buffering phase, each phase lasted 14 minutes. Baseline 1 and 2 refers to the first 28 minutes of the study. During this time the subjects relaxed in a comfortable recliner, but were neither grounded nor sham grounded. Intervention 1 and 2 refers to the second 28 minutes of the study. During this time the subjects underwent either grounding or sham grounding. Measurements were taken during the B2 and I1 phases. During this period, each acupoint was tested a total of 30 times.

The results of the study showed that the mean BP decreased significantly in every meridian in the subjects who were grounded. This result was not seen in the control group. The results were more significant in the meridians of the lower half of the body, possibly due to the location of the conductive electrode on the sole of the foot.

The results for AP were less significant and grounding was found to only affect two meridians. The results for IQ showed no statistical significance between the two groups.

Decreased BP in the grounded subjects suggest that grounding was having an anti-inflammatory effect and increasing activity in the parasympathetic branch of the autonomic nervous system. The parasympathetic nervous system is activated during rest and relaxation and increased parasympathetic activity is indicative of reduced stress levels. These results are consistent with other previous research on the effects of grounding on human physiology.