Non-Invasive Natural Healing with Directed Energy™

An Introduction to PEMF

Dr. Larry Basch, D.C., CCSP, CCEP, ICSC

Certified Sports, Extremity, International & Military Sports Chiropractor

www.RechargePulseWave.com

Dr. Larry Basch, D.C., CCSP, CCEP, ICSC

Certified Sports, Extremity, International & Military Sports Chiropractor
U.S. Navy Sports Medicine / U.S. Marine Corps Sports Chiropractor
USMC School of Infantry Chiropractic Clinic, Camp Pendleton, CA

First a little about me. My goal is to share my years of clinical experiences and these 21st century therapeutic tools, which I have been using in one of the nation's busiest military Sports Medicine clinics and help others in developing a successful non-invasive natural therapies practice.

The products I recommend are newer technologies, extremely safe, natural, non-invasive therapies which can be used alone, or better when used in conjunction with other therapies or treatment modalities. And if needed, can be used along with medication or other non-invasive and invasive medical procedures.

As a highly credentialed, experienced, and progressive Board-Certified Sports, Extremity, International & Military Chiropractor, I have over 30 years of experience in multi-discipline clinics including over 15 years of military Chiropractic clinic management in 4 different multi-discipline Military Sports Medicine clinics. I also have past HMO Utilization Management & Clinical Review experience as a Clinical Care Manager for the Nation's largest Chiropractic HMO. I also have years of experience providing Acupuncture in Chicago, as well as nutritional sales and hormone lab experience.

Over my career, I have worked in 28 different clinics, and I have treated tens of thousands of patients from U.S. Military, U.S. Special Forces, and foreign military, from infants to seniors to world champion power lifters, NFL & NBA professional athletes and even some Rock n Roll superstars as well as many patients with unique and special conditions. I am also a 10-year Veteran of U.S. Marine Corps and Illinois Army National Guard.

I am one of only nine Chiropractors working for the U.S. Marine Corps. Over the years, within both my military and civilian clinics, I have met with manufacturers, owners, CFO's and sales managers of many brands of PEMF, Shockwave and Lasers and more, searching for the best therapies for the best value. In my busy military practice, I have done extended, long-term demo use of numerous therapies. I will share this knowledge with those progressive practitioners looking for the best non-invasive products at the best price.

Note: some of these companies allow me to offer you the same "military discount pricing" which you could not get from the traditional sales reps.

If you are looking to purchase, I will save you money. Please don't just buy from a sales rep; invest and learn from an experienced clinician & colleague while supporting others in our profession. I have done the product comparisons and research for you. Please feel free to contact me. Thank you, Larry

Dr. Larry Basch, D.C., CCSP, CCEP, ICSC

www.RechargePulseWave.com

LBASCHDC@gmail.com ***Ph: 858-945-8118***

EIN # 26-1657557 CA Resale Permit # 22-4191872 DUNS# 133874680 Cage # 3GN74

Note: ***IRS Section 179 may allow business owners to deduct the full purchase price of qualifying equipment and software that was purchased or financed during the tax year, rather than depreciating it over the asset's useful life.***

Equipment Finance Available at:

Stearns Bank 1-800-247-1922 Ext 3199 Ellen Boguist 320-248-7116 EllenB@stearnsbank.com

***Most All Items Recommended are Approved for Military Purchase thru DoD Prime Tier 1 Vendor**

First, A Few HealthCare Facts:

This paper discusses a novel therapy which is very different from the "traditional medicine" approach to health care. Our goal should always be to seek safe, effective, natural approaches to health care and disease prevention **as the first choice.** Based on theories from some of the greatest minds and scientific pioneers, PEMF evolved. I have incorporated PEMF therapy combined with other various forms of what I call "Directed Energy" such as joint manipulation, shockwave, whole body vibration, myofascial methods and nutrition to assist the body's innate ability to heal naturally. As a Doctor of Chiropractic, my profession is considered an outsider for maintaining a natural non-invasive approach. But look at some of these facts, side effects and follow the money of medicine in the USA!

Modern medicine has made many miraculous discoveries and treatments. However, our current health care model has been dominated and controlled by the powerful American Medical Association (AMA), Lobbyist and the Pharmaceutical companies, all who spend millions of dollars annually (AMA spent $18 million in 2016)[3] in the education, promotion, and advertisement for the use of drugs to treat most all human ailments. These two groups contribute tens of millions of dollars each year to lobby the politicians to pass legislation in favor of medicine and drug companies (From 1998 to 2014, Big Pharma spent nearly $2.9 billion on lobbying expenses, more than any other industry. The industry also doled out more than $15 million in campaign contributions from 2013-14.)[4.] Big Pharma spends **19 times** more money on *ADVERTISING* than they do on *RESEARCH* of the drugs they want us to consume! Therefore, anything questioning the standard American Medical & pharmaceutical approach to health is viewed as alternative, often questioned as a threat to the control of the AMA, Big Pharma & Insurance companies.

Yet, Low Back Pain is now the No. 1 disability in the world[1]. A 2016 study from John Hopkins University, published in the prestigious British Medical Journal confirms that **Medical Errors in the U.S. are now the THIRD Leading cause of Death in the USA.[2]**

The Centers for Disease Control and Prevention recently classified prescription **drug abuse** in the United States an ***epidemic*.** The U.S. is home to about **4.5 % of the world's population**, yet ***we consume 56% of all the medications in the world AND 80% of the world's pain medication***. Yet we are ranked 37th in the world in overall health. Nonsteroidal anti-inflammatory drug (NSAID) use in the U.S. increased 41% from 2005 to 2010.[9] It has been estimated conservatively that ***16,500 NSAID-related deaths*** occur among patients with rheumatoid arthritis or osteoarthritis every year in the United States.[10] Ninety-one Americans die every day from an opioid overdose.[11]

This paper will discuss a relatively new therapeutic modality called **Pulsed Electro-Magnetic Field or PEMF**. A therapy that is ***Safe, Pain Free, Non-Pharmacological, Non-Invasive*** and effective because it works on the cellular and molecular level with no side effects!

I also incorporate expert Joint Manipulation, Shockwave therapy, Whole Body Vibration, Laser, Nutrition, Oxygen, and Electrically Charged, Micro-Clustered Hydrogen Alkaline Water.

Shouldn't this type of therapy be our first choice?

Our U.S. HealthCare System is Broken

Sorry folks, there is NO MAJIC PILL

Forget the Drugs, Needle or Surgery

Repair - Restore - ReCharge

with

Non-Invasive Natural Healing with Directed Energies
PEMF, ShockWave, Whole Body Vibration & More

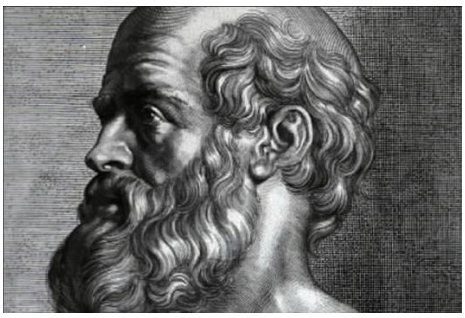
Safe, Non-Invasive, Non-Surgical Treatment of
Muscle, Soft Tissue, Skin Conditions, Joint, Bone, Neurological Conditions and more!

References:

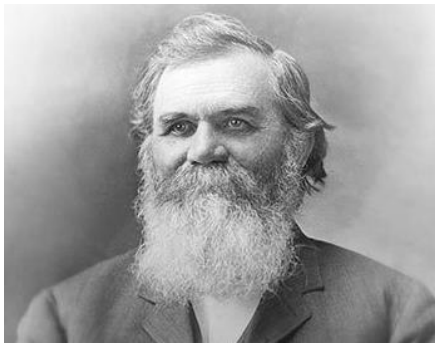
1. The global burden of low back pain: estimates from the Global Burden of Disease 2010 study, Damian Hoy, et al., *Annals of the Rheumatic Diseases*
2. http://www.bmj.com/content/353/bmj.i2139/rapid-responses
3. https://www.opensecrets.org/lobby/clientsum.php?id=D000000068
4. https://www.drugwatch.com/manufacturer/
5 JMPT June 2004;27(5):314-26 *"Central neuronal plasticity, low back pain and spinal manipulative therapy."* renowned neurophysiologist Richard Gillette.
6. Annals of Pharmacotherapy, 2002
7. New England Journal of Medicine, 1999
8. https://www.propublica.org/article/tylenol-mcneil-fda-behind-the-numbers
9. https://www.ncbi.nlm.nih.gov/pubmed/23723142
10. http://americannutritionassociation.org/newsletter/deadly-nsaids
11 https://www.cdc.gov/drugoverdose/epidemic/

Way Ahead of their Time, Thinking Outside the Box

The pioneering Greek physician Hippocrates, known as "The Father of Western Medicine", said "Look well to the spine for the cause of disease".



Hippocrates

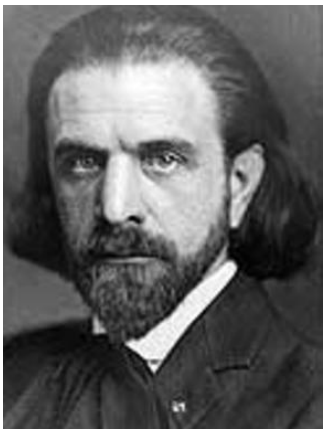


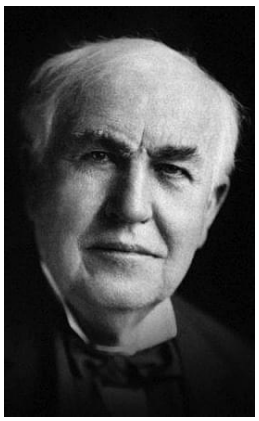
There is a vast difference between treating effects and adjusting the cause.

D.D. Palmer, D.C.
Founder of Chiropractic

Medicine is the study of disease and what causes man to die.
Chiropractic is the study of health and what causes man to live.

B.J. Palmer, D.C.

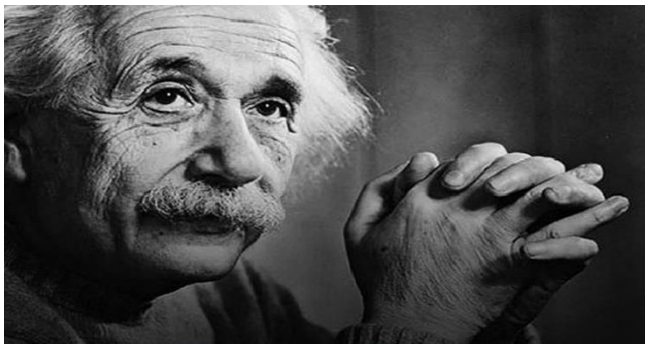




"The doctor of the future will give no medication but will interest his patients in the care of the human frame, diet and in the cause and prevention of disease"

Thomas Edison

Way Ahead of their Time, Thinking Outside the Box

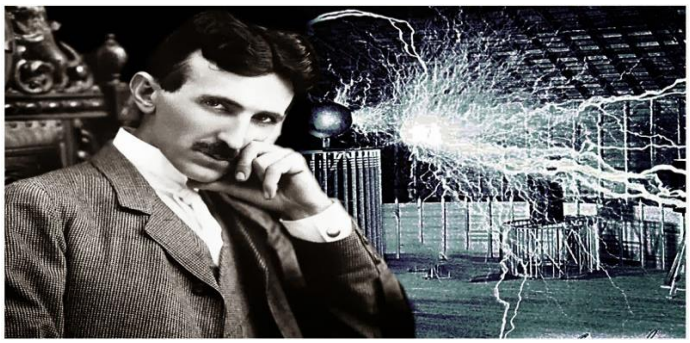


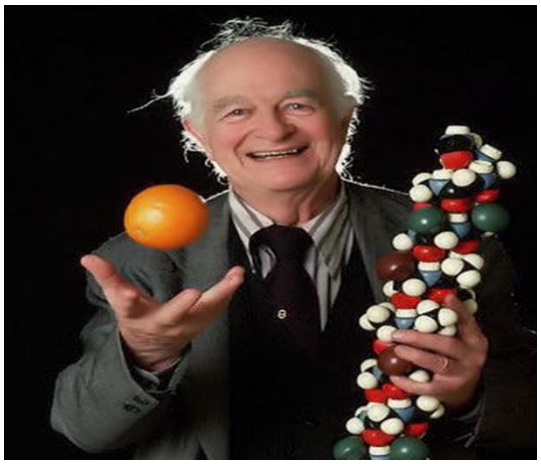
The future of Medicine will be the Medicine of Frequencies.

Albert Einstein

If you want to find the secrets of the Universe, think in terms of Energy, Frequency and Vibration

Nikola Tesla





All Cellular Activity can only take place thanks to Electrical Impulse. PEMF is a benefit for mankind, from the infant to the geriatric, and it will lead to a change in the paradigm of Medicine."

Linus Pauling, PhD x2 **2-Time Nobel Prize Winner**

In the 1930's YALE MEDICAL UNIVERSITY published *93 Papers* on BIOLOGICAL ELECTRICITY

He discovered that the **DEPLETION OF ELECTRICAL ENERGY FIELD** of an organ preceded the onset of general **"UNWELLNESS" AND EVENTUALLY DISEASE.**

Professor Harold Burr

So What is PEMF?

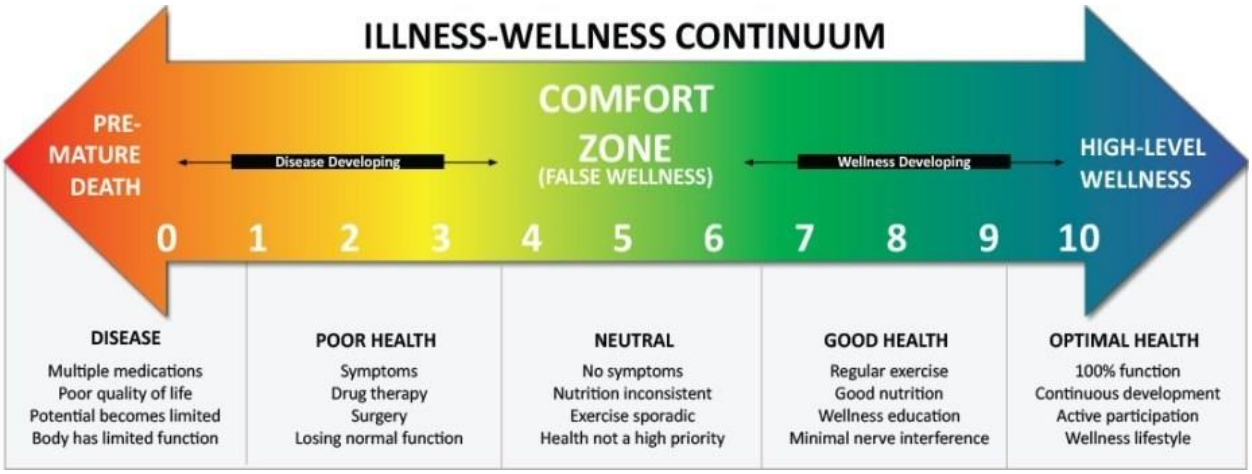
PEMF stands for **Pulsed Electro-Magnetic Field**, a soothing and Electro-Magnetic therapeutic modality that can help people across a wide spectrum of health care and wellness to stimulate their cells for enhanced cell function, pain reduction, improved cell wellness and energize all aspects of their lives.

I use Pulsed Electro-Magnetic Field Therapy as a part of my "Directed Energy"™ treatment approach to relax muscles, increase range of motion, reduce pain, and assist the body towards improved cell function to achieve safe, non-invasive, natural healing and recovery. ***Larry Basch, D.C.***

The principles of PEMF were first described by Nikoli Tesla in 1898. In modern health care, we have numerous therapies which use slightly different types of energy which is directed into the body to affect changes in tissues. We use our hands to direct energy into tissues via manipulation, massage, myofascial therapy. When PEMF energy is delivered into the body, I call this a form of *Directed Energy*™ which is affecting significant electrical changes on a cellular level at the cell membranes, including the nervous system, and even down to the molecular level. This increases cellular oxygenation and nutrient exchange, increases micro-circulation, reduces pain, thereby enhancing the body's natural healing and regenerative processes.

Researchers have known for years that disruption of the electromagnetic energy in cells causes impaired cell function. PEMF Therapy address the impaired biochemistry and function of the cells, which in turn improves health by delivering beneficial health-enhancing energy to every cell in the body.

If you hold two magnets and try to force them together, you feel the resistance between them, this is a static magnetic field. A pulsing magnetic field is generated by moving a changing electric current through a magnetic coil. This is called an electromagnetic field. Today, researchers have bridged the gap between early pioneering discoveries and modern technology to create a natural alternative for greater cell function, blood circulation & wellness. PEMF can help to mitigate pain, stimulate immune support, improve performance, and enhance organ and brain function as well as so much more.



PEMF Therapy is like Re-Charging a drained battery which is not functioning properly.

Nothing happens in the body without an Electro-Magnetic Energy exchange.

All 70 - 100 trillion cells in the body communicate via Electro-Magnetic frequencies.

All Living Cells have an Electrical Charge across the Cell Membrane

Less than -20 mV	- 40 mV	- 50 mV	- 60 mV	- 70 mV	-100 mV
Cancers & Cell Mutations	*Chronic Illness*		*Weakened Cells*	*Healthy Cells*	

PEMF does the Following

Reduce	Accelerate	Improve	Balance
Acute & Chronic Pain	Soft Tissue Repair	Cell Regeneration	Immune Balance
Inflammation	Muscle Relaxation	Blood Circulation	Blood Oxygenation
Muscle Tightness	Bone Regeneration	Energy Production	Intracellular Minerals
Platelet Adhesion	Recovery from Activity	Arthritis Mobility	Endocrine Function

Improves Blood Flow

PEMF has been proven to **IMPROVE MICRO-CIRCULATION BLOOD FLOW** up to **30%.**
PEMF increases **CELL OXYGEN ABSORPTION** up to **200%.**

Improves Brain Function and Focus

PEMF exercise directly stimulates your brain, leaving you feeling energized & focused.

Improves Relaxation and Sleep

Energizing your cells with PEMF can help you relax and sleep soundly. That extra rest can mean less stress, and improved overall health.

Reduces Pain, Maximize Bone and Joint Health

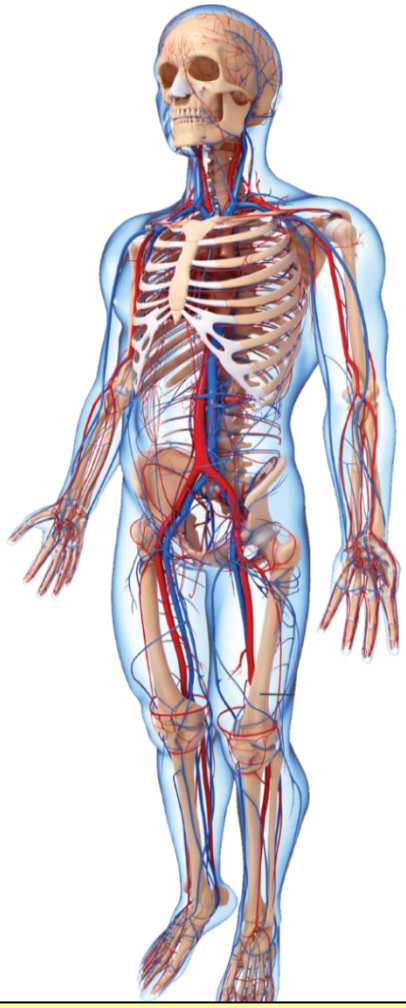
Many people have experienced pain relief through long-term improvements to their bone and joint health. PEMF can lead to a more active and pain-free lifestyle

History of PEMF

Pulsed Electromagnetic Field Therapy might seem like a new technology in North America, but it has been safely used throughout Europe and other countries for more than 50 years. The science behind PEMF is a well-studied methodology and is based on research of Nikola Tesla over 100 years ago. Electromagnetic field therapy has been in use since the invention of electricity, and positive effects were well established by the mid 1900's. The earliest commercially produced low PEMF devices entered the market in the early 1900's. Although electricity's potential to aid bone healing was reported as early as 1841, it was not until the mid-1950s that scientists seriously studied the subject.

PEMF is a non-invasive, drug free method to create increased micro-circulation, muscle stimulation, and long term pain relief that helps you return to a normal, active lifestyle. It is also used as a wellness and recovery therapy for athletes.

According to research from Harold Burr, PhD at Yale Medical University from as far back as **1932**, it was discovered that the depletion of electrical energy field of an organ preceded the onset of general "unwellness" and eventually disease. If the electrical imbalance is corrected, the disease does not manifest. **Professor Burr published 93 papers on Biological Electricity. Pulsed electromagnetic field is a donating source of energy that helps the weakened cells repair and regenerate and naturally, enhancing the functionality of cells.**



High Power PEMF devices entered the market around 1975, with a focus on the health of bones, muscle, nerves, tendons, ligaments and cartilage. Thousands of studies have proven the benefits of PEMF and it is a widely used therapy for multiple conditions, improved health and enhanced performance of people and animals around the world. PEMF therapy has several FDA approvals and used by a variety of healthcare providers and by athletes in most all professional sports. PEMF is now in the process of being approved for many other uses, including sports injuries. The benefits of PEMF therapy have been demonstrated through more than 2000 University level, double blind, medical studies and thousands of research papers validating the therapeutic benefits of PEMF. (Read thousands of peered-reviewed abstracts on PEMF therapy at www.PubMed.com & www.pemfinfo.com)

PEMF was widely adopted in East and Western Europe but its use was restricted to animals in North America where Veterinarians became the first health professionals to use PEMF therapy, usually to heal broken legs and heal skin wounds in racehorses. PEMF has also demonstrated an ability to increase micro-circulation, increase cellular and tissues regeneration and to quickly reduce pain.

*As **Dr. Magda Havas,** Professor of Environmental & Resource Studies at Trent University states, "PEMF (pulsed electromagnetic field) devices DO NOT treat a specific condition. **Instead, they OPTIMIZE the body's natural self-healing and self-regulating function**."*

After early space travel in the 1960's, American astronauts returned to earth very sick and with depleted strength and energy. In 2003, NASA's Johnson Space Center made the study of PEMF a priority for helping astronauts reduce bone loss and muscle atrophy, as well as supplementing the body's natural healing processes while engaged in space exploration. NASA scientists observed a new, previously unreported illness experienced by a number of the first astronauts. This illness came to be known as "space sickness". NASA eventually determined the decreased exposure to the earth's magnetic field was found to be responsible for the astronauts "space sickness". This sickness was due to being cut off from the earth's magnetic charge.

Once NASA equipped space capsules with Pulsating Magnetic Fields, the astronauts no longer faced the same problems with sickness and lack of energy. Since those historic flights, zero field studies, experiments done in chambers made of metal which blocks all magnetic fields of the earth have confirmed that living cells will die within hours if they do not receive the PEMF's of the Earth. That includes human cells. So PEMF's are as much required element of health as food water, oxygen and sleep. In fact, you can live longer without food and water than you can without PEMFs. Some call PEMF the fifth essential element to life.

In 2003 **NASA**'s four year, multi-million-dollar research study concluded:

PEMF therapy is the most effective form of healing for the Repair and Regeneration of human and animal cells. [18]

PEMF has been used in the International Space Program.

Hospitals use PEMF therapy to accelerate the healing of fractures which can be treated even through a plaster cast, since magnetic fields permeate all materials.

PEMF Therapy is a proven safe and very effective for pain management and, chronic conditions. Madigan Army Medical Center, Tacoma, WA, USA conducted a double blind test for migraines with PEMF therapy with positive results of 75% showing decreased headache activity. From clinical experiments, we know that PEMF can reduce pain sensations almost immediately.

It is known that when chronic stress in the endocrine system, especially the adrenal glands, becomes depleted, this leads to reduced endocrine function. This can lead to low energy or Adrenal Fatigue and/or Adrenal Exhaustion, commonly called "burn out". Every cell in our body eventually dies and is replaced with new cells. This is the cycle of life, but proper energy and nutrients are required.

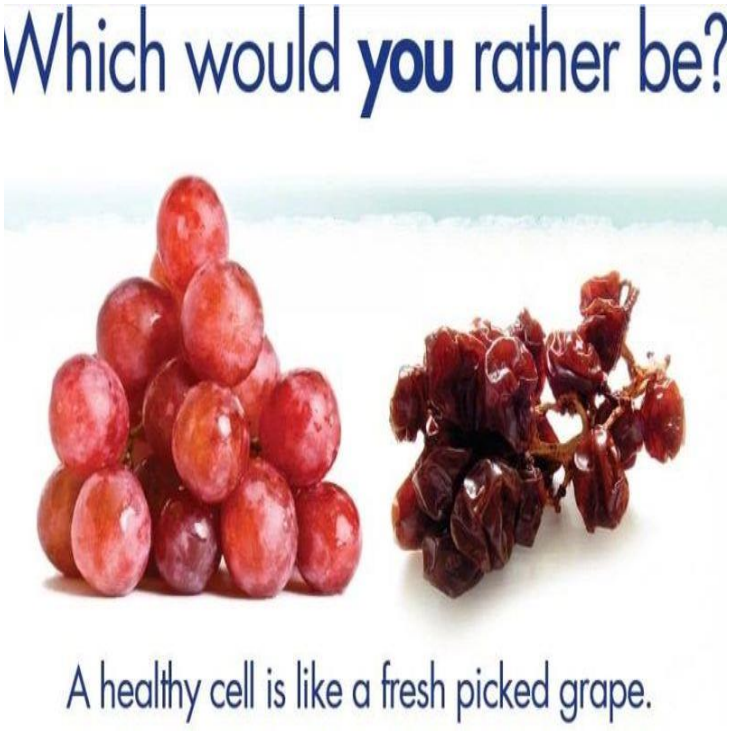
Regular use of PEMF can help you keep this cycle running like it should and maintain your health. The direct effects of PEMF electromagnetic fields are: improved neuron firing, calcium ion movement, membrane potentials, endorphin levels, nitric oxide, dopamine levels, and nerve regeneration. Indirect benefits of magnetic fields on physiologic function are on: circulation, muscle, edema, tissue oxygen, inflammation, healing, prostaglandins, cellular metabolism, and cell energy levels.

All these affects help reduce inflammation and promote healing and is safe, non-invasive and has no side effects. PEMF is a therapy is a viable alternative to drugs for the treatment of pain and inflammation in that is related to a variety of causes such as arthritis, surgery, and wounds. Without the use of drugs, PEMF has proven to improve circulation, increase blood oxygen, relax muscle spasms, enhance muscle tone, and increase range of motion.

We can also think of PEMF as a battery recharger for the human cell. We now know that the voltage of a healthy cell is about -70 millivolts and when we get sick that voltage can drop to as low as -30 millivolts or lower in the cases of cancers. Pulsed electromagnetic fields (PEMF) act like a catalyst and battery recharger for the human cells and these PEMF's are critical for human cell metabolism.

PEMF is used to positively impact energy within the body by directing a non-invasive form of repetitive electromagnetic pulses into the body towards the affected cells, stimulating a healthier response. PEMF re-energizes weakened, aging and damaged cells by inducing electrical charges within the cell helping to restore it to its normal healthy state.

All types of cells respond: muscle cells, blood cells, brain cells, bone cells. Why? The magnetic field "permeates" all cells in the body simultaneously, down to the last molecular level --reaching parts of the body that cannot be influenced efficiently with other methods to enhance ion exchange, cell voltage, normalize circulation, and increase the oxygen utilization of the cell. Acute and even chronic conditions may disappear completely.



We know that most all medication interfere with normal healthy cell function. However, unlike medications, PEMF actually improves cell function, with no side effects.

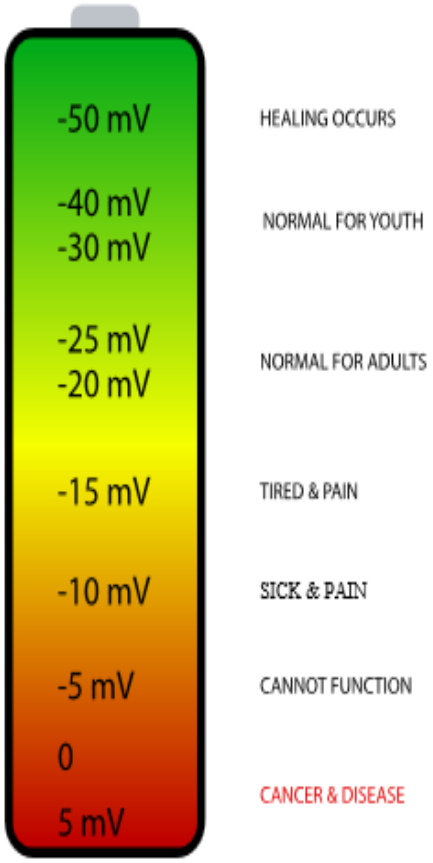
PEMF is often called cellular exercise since it will "exercise" or pump the human's cells to help the cell membranes more readily take in water, minerals, and nutrients. This will "plump" up the cells with water and healthy nutrients, allowing them to function better and produce energy more efficiently without interfering with normal function.

If cells do not receive the PEMFs of the earth, they die within hours. Human beings, as well as all earthly life forms, are somehow energetically attuned to the weak background magnetic field of the planet. The earth emits a magnetic field, but you may not realize that this magnetic field changes with time and has a very precise frequency and intensity that drives all life on planet earth. Much more than a simple directional guidance for birds, bees and human navigation, this pulsed electromagnetic field of the earth is the catalyst, the very spark of all biochemical reactions occurring in life forms. We as humans need these pulsating magnetic fields not only to be healthy, but actually stay alive!

Because of the earth's weakening magnetic field and the steel and concrete structures we inhabit; we are not getting the full benefit of the earth's electromagnetic field. We are constantly exposed to high frequency electromagnetic pollution today, which weakens cells. This comes from computers, TV's, cordless phones, cell towers and cell phones, and the rollout of 5G presents some serious concerns.

PEMF penetrates into the body to affect the trillions of cells, delivering healthy energy to cell membranes and into the cells organelles. This stimulates cellular metabolism by increasing the flow of electrons and ions across the cell membrane. This effect involves a chain of biochemical reactions within the cells, which then increases the cells intake of oxygen and nutrients across the cellular membrane, while increasing the removal of cellular waste and toxins out of the cell which leads to the improvement of health without side effects. PEMF therapy increases blood micro circulation and nerve activity in and around damaged tissue, which also helps damaged cells heal, naturally.

Perhaps the easiest way to understand PEMF is to think in terms of each cell in your body as if it were a little battery. Like with any battery, sometimes your cells become tired and worn, whether due to age, stress, overuse, or damage, making it more difficult for them to function properly and leading to cellular damage, which is linked to pain, aging and more serious issues affecting cell's DNA.



PEMF therapy has proven beneficial in stimulating cellular metabolism, increased blood and fluids circulation, tissue regeneration and immune system response. PEMF treatment is effective at increasing bone formation and bone density, healing fractures, recovery from wounds and trauma, graft and post-surgical issues, recovery from myocardial and brain ischemia (heart attack and stroke), tendonitis, osteoarthritis, and urinary incontinence, prostate issues, impaired neural function or spasticity from central nervous system diseases such as multiple sclerosis and spinal cord damage.

The restoration of human cell function is what sets this technology apart from all other devices, as it helps your cells function better. PEMF therapy does not treat a specific condition. Instead, it optimizes the body's natural self-healing and self-regulating function. PEMF therapy improves recovery from sports activity, and may improve performance in athletes. PEMF re-energizes the cells leaving you feeling relaxed, energized and with a sense of well-being. PEMF can be a standalone therapy. However, when used in combination with other synergist therapies which can be added to a treatment plan, we can achieve greater pain reduction and restoration of health, safely and naturally.

When cells are toxic, degenerated, or damaged, the cell membrane gets thick and stiff; therefore, the electrical and chemical receptors don't function properly. During a PEMF session when the pulsating field reaches the cells, the cell membranes are exercised and they become more flexible and more vital, like they were when they were younger and healthier. The cells expand, fresh nutrients and oxygen rush into the cells. The cells then contract and push toxins out. As a result, the cells are cleansed and refreshed.

A common cause of confusion regarding Pulsed Electromagnetic Field (PEMF) therapy is that it is associated with the harmful ***Electromagnetic Fields (EMFs)*** that are present within the environment. However, the pulsed electromagnetic fields differ from the harmful electromagnetic fields in several ways. Continue reading for more information on the main differences between PEMF and EMFs.

Magnetic frequencies help to regulate several processes of the human body. In fact, our bodies even produce their own magnetic fields. However, when artificial and harmful electromagnetic fields enter your body, such as those from cell phone service or power lines, they can disrupt the way your body naturally works, creating an imbalance. This can cause changes to any of the natural systems within your body, from your stress levels to your sleep cycles, to your DNA. This imbalance may also make your body more susceptible to disease.

Beyond the effects of these electromagnetic fields on your body, the differentiating factors, or what actually makes one frequency harmful, and the other beneficial are the exposure time, the wavelength, and the frequency. Harmful electromagnetic fields have been recognized in various research studies to have significantly higher frequencies and lower wavelengths than therapeutic PEMFs. Most PEMF devices use low frequencies and long wavelengths, ranging from 1 to 10,000 Hertz, and do not produce any heating action. In comparison, a microwave, which produces harmful EMFs can use frequencies in the range of 100,000,000 Hertz.

The demand is increasing for effective natural treatment option without harmful side effects of drugs. Diabetic patients have seen reduced pain from neuropathy with PEMF stimulation of nerve cell repairing in a matter of weeks. Athletes and body builders use PEMF to get better focus and performance before an event and immediately after to maximize the speed of recovery of sore muscles, tissues and ligaments.

FDA Approval of PEMF

PEMF therapy has several U.S. FDA approvals as well as Health Canada (HC) and European Medicines Agencies (EMA) Approvals.

1979: FDA approved PEMF therapy for the healing of nonunion **Fractures** & stimulating **Bone Growth**. This has applications for bone degenerating diseases like osteoporosis and boosting the healing of fractures.
1987: FDA approved PEMF as an adjunct therapy for reducing post-operative **Edema** and **Pain**. Edema plagues millions of people in the U.S., and it is specifically an issue for people with diabetes.
1998: FDA approved PEMF Therapy for **Urinary Incontinence** and muscle stimulation.
2004: FDA approved PEMF to be used as an adjunct to **Cervical Fusion Surgery**. Cervical fusion is a permanent change to the spinal anatomy. Often, patients still experience residual pain even after this surgical procedure. PEMF is used to reduce this residual, chronic pain.
2008: FDA approved PEMF for treatment of **Depression** and **Anxiety** for those who have shown to be unresponsive to medication. The applications of this are monumental! Depression and anxiety go hand in hand and are a struggle for millions of Americans. Both are highly responsive to PEMF.
2011: FDA approved PEMF Therapy for treatment of **Brain Cancers**.
2015: FDA reclassified PEMF devices from their existing Class 3 category to a Class 2 status, and most PEMF devices that are sold today in the United States are FDA registered as wellness devices.

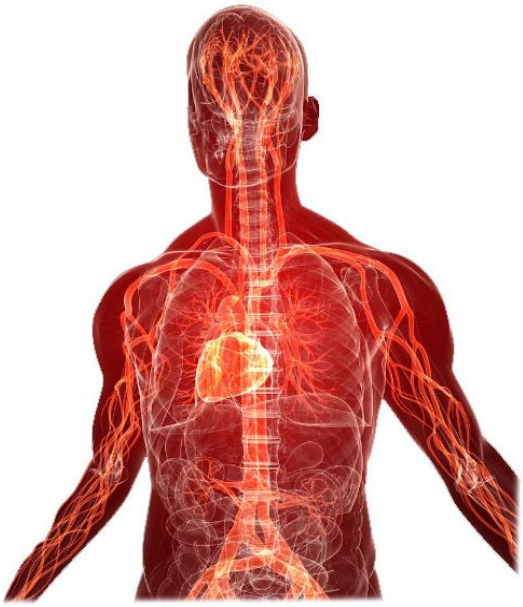
Continued research shows remarkable results with wound healing and recovery, reduction of prostate inflammation, urinary incontinence, gout flares, chronic migraines, and the list goes on.

What does PEMF treat?

Theoretically, PEMF manufacturers will make no claim to treat any condition, but rather the goal is to improve cellular function, reduce pain and aid in recovery by affecting the most basic of human physiology, improved cell function.

Most all health conditions can benefit from ***Increased Micro-Circulation, Increased Oxygenation Of Tissues, Increased Electrolyte Uptake*** resulting in **improved cellular function and increased cell energy.**

PEMF shouldn't be thought of as "treating" conditions, but rather as a modality that optimizes the natural self-healing environment within our body.



What are the benefits of PEMF Therapy?

- ***Improves Depression***
- ***Improves Physical Energy***
- ***Improves Sleep***
- ***Strengthens Immune Function***
- ***Improves Bone Healing & Bone Density***
- ***Reduces Acute & Chronic Pain***
- ***Helps with Muscle Pain & Fibromyalgia***
- ***Improves Osteoarthritis Pain***

- ***Faster Recovery from Injury & surgery***
- ***Increases Blood Circulation***
- ***Increased Oxygenation & Calcium influx***
- ***Improves Cell Function***
- ***Reduced Soreness, muscles & cramping***
- ***Improves Cell Health & Function***
- ***Shows promise in helping with the future of regenerative medicine***

Dr. Terry Tennant, MD*, Author of "****Healing is Voltage****": states "****All Life is Energy****, and all energy is electromagnetic. The cells require electricity. When cells drop their electrical charge to a certain level, they become sick. The first signs is illness is usually pain. Chronic disease (pain) is always defined by low electrical charge."*

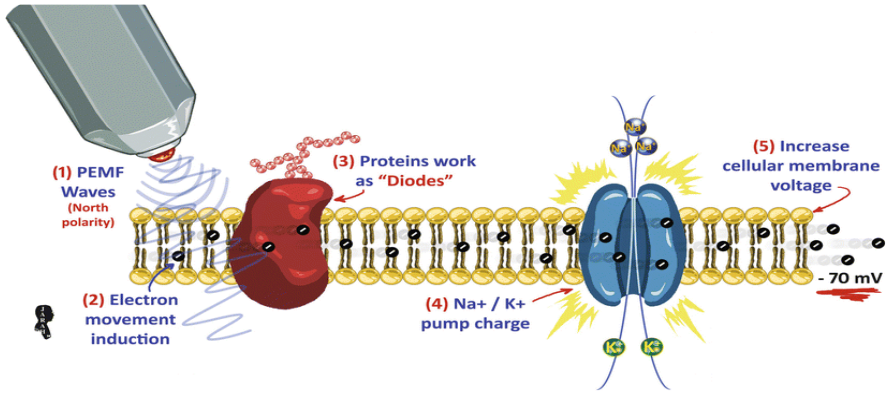
Concluding, ***"With enough voltage and raw materials, the body can heal almost anything."***

Physiological Effects of PEMF Therapy

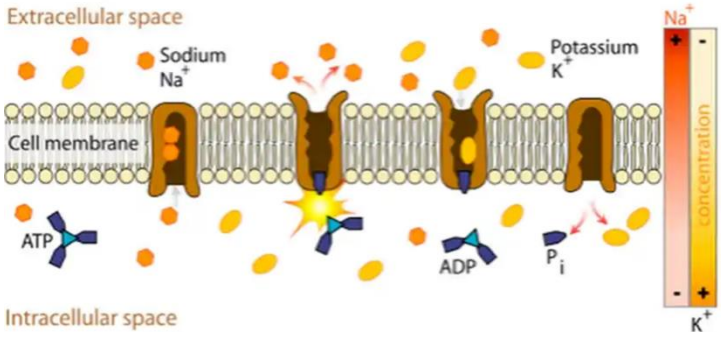
Depolarization of Cell Membranes

- Increased Cell Membrane Permeability via **Depolarization**
- Temporarily hyperpolarize and depolarize the cellular and intracellular membranes, increasing cellular oxygenation and nutrient uptake increased toxin release from cells.
- Increasing cell membrane permeability means the cells can breathe better; they can take in oxygen easier, and push toxins out more efficiently. This also means nutrients and medicines are more bioavailable.
- Increases the TMP (Trans Membrane Potential) and ion flow across the cell membrane by Stimulating the NA+/K+ pump and taking NA+ out with K+ into the cell (7)
- Cellular electrical properties such as membrane surface charge & membrane potential can be readily influenced (7)
- Temporarily hyperpolarize and depolarize the membrane thus increasing cellular oxygenation and nutrition. Increased cell membrane permeability allows better oxygen and nutrient uptake by the cells and increased toxins release from the cells (7)

Depolarization Improves Cell & Nerve Function, Increased ATP Production



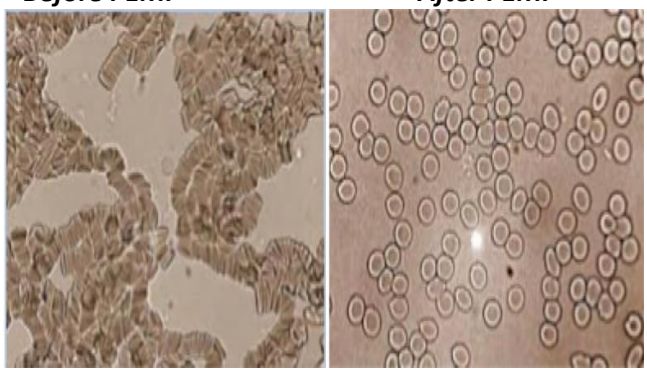
Increased Action Potential (channel opening) Requires Electrical Activity.

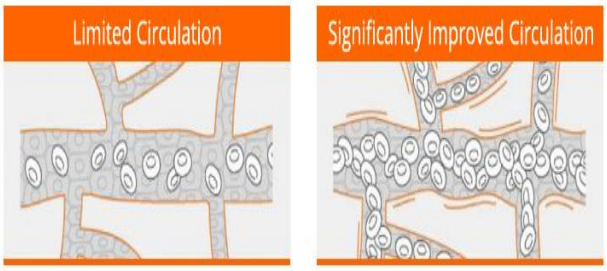


The cell membrane itself has a voltage **TMP** (**transmembrane potential**). The channels in the membrane are opened or closed based on the **polarity of the membrane**. When the channels are **closed,** a cell membrane is at its "**resting potential**" and when it is open, it is at its "action potential." Once all channels are open, the membrane potential is so great that the polarity of the membrane reverses, and then the channels begin to close. As the entry channels close, exit channels are activated. Once the process is complete, all channels close and the membrane returns to its resting potential. During this process, the electrical potential of the membrane rapidly rises. This allows the channels to open up. As the channels open, ions flow into the cell. This then causes a further rise in the membrane potential, prompting even more channels to open up. This process produces an electric current (and therefore magnetic field) across the cell membrane, and the cycle continues.

Improved Blood Flow

Before PEMF ***After PEMF*** ***Before PEMF*** ***After PEMF***





Red Blood cells Clumped together
This is Called Rouloux formation
Poor Blood flow & oxygenation

Reduced Rouloux formation
Much better blood flow
Better flow & oxygenation of tissues

NASA Study Confirmed this Increased Blood Flow
PEMF Reduces Rouloux formation in capillaries

Improved Blood Flow and Circulation

- It is indisputable that healthy blood circulation is vital to good health and the most basic functions of PEMF in the body is increased micro circulation. When a cell (such as a red blood cell) is injured or ill, it does not hold its ideal electrical charge. This causes red blood cells to stick together or clump, making circulation slow. When a magnetic field passes through the red cell, the membrane becomes properly charged, allowing the cell to repel itself and keep itself separate from other red cells, thereby increasing circulation. In addition, PEMFs increase various chemicals including nitric oxide within the blood vessel walls that cause the blood vessels to dilate, improving the amount of blood flowing through the vessels and therefore increasing the amount of oxygen delivered to the tissues. Blood is the body's universal means of transport; oxygen, nutrients, chemical messengers (e.g., hormones) and immune cells are all transported through our blood. When our body's cells, tissues and organs are adequately nourished and metabolic waste products are removed, our bodies become healthy and function properly. Many musculoskeletal issues are directly related to diminished circulatory system which can result in dysfunctional metabolic processes.
- PEMF also increases lymphatic flow and drainage.
- Circulation is increased in the area treated with PEMF **immediately.**
- Stimulates blood flow and lymphatic movement and drainage.
- Increased Circulation reduces tissues inflammation
- Increases nutrient & oxygen deliver to tissues & cells.
- Improved Circulation decreases inflammation and Oxidative Stress thus harmful free radical production.
- Immediate increase in vascular flow, enhancing circulation. (9)
- Improved circulation and oxygenation (9)
- Increases circulation by restoring normal Ca2+ ion flux and Na+/K+ balance (10)
- Thirty minutes of treatment induced an increase in microvascular blood flow and tissue oxygenation that persisted for at least 3 hours. (11)

General exhaustion of the body, caused by stress, injury, or chronic disease, will reduce the cell's trans-membrane potential (TMP). If this potential approaches the zero level, the cell dies. A cell uses 50% of its internal energy to maintain this trans-membrane potential. When PEMF is used, it has been shown to increase in the oxygen content of the blood and in turn within the cell, and the trans-membrane potential is said to be normalized. Healthy cells have an internal charge of -70 to -100 mV or millivolts, weakened or injured cells have -30-60mv, cell death or cancer occurs at -20 mv or below.

**** PEMF has been shown to improve Micro-Circulation blood flow up to 30%.***

**** PEMF has been shown to increase Cell Oxygen Absorption by up to 200%.***

Figure 1 Below shows a comparison of blood flow after stimulation of the right foot (red) versus the absence of stimulation to the left foot (blue).

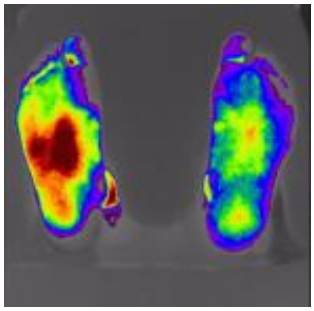
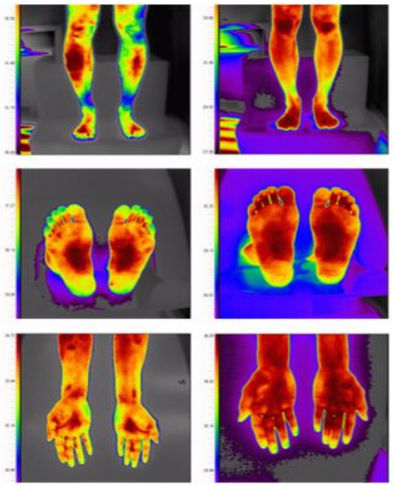


Figure 2 Right shows before (left) and after (right) images of various body parts stimulated with PEMF. The increase in red color on the right corresponds to the increase in oxygenated blood flow to those body areas after PEMF stimulation.



Nitric Oxide Production Increased

- Nitric Oxide (NO) acts to open up blood vessels and improve circulation.
- Modulates the release of NO from eNOS and potentially affect the entire tissue repair pathway, from pain and edema to angiogenesis, bone and tissue regeneration, and other regenerative action (9)
- Increase the rate of Ca2+ binding to CaM, which then catalyzes cNOS (eg., eNOS), producing an immediate (within seconds) production of NO. (9)
- Mechanically stimulates lymphatic drainage and blood flow (9)

Decreased Inflammation

- Inflammation is a primary cause of many chronic conditions.
  This is often due to an impairment of oxygenation of cells.
- PEMF helps regulate pro-inflammatory cytokines.
- Protect tissue from the high inflammatory cytokine environment (1)
- When left unregulated, chronic inflammation is a major cause of chronic conditions and autoimmune dysfunction. When the cells work harder to absorb oxygen necessary to produce cellular energy, those cells go into oxidative stress. This leads to an over production of free radicals and premature cell death or apoptosis.
- Reduce some of the most well-known pro-inflammatory cytokines such as tumor necrosis factor-α (TNF-α), interleukin (IL)-1β, IL-6, and IL-8 release (2)
- Increase A2A and A3 adenosine receptor expression, contributing to suppression of pro-inflammatory cytokine release, such as TNFα and IL-1, which are harmful to cartilage homeostasis (4,5)
- Stimulate matrix synthesis and, at the same time, suppress inflammatory cytokines. (6)
- Bring the inflammatory milieu back to homeostasis (7)
- Decrease in TNF-α, a **pro** inflammatory cytokine involved in systemic inflammation, produced mainly by activated macrophages. In activated MSCs, cytokine IL-3 and IL-4 results showed a stabilization of these signaling molecules after cells were exposed to PEMF

PEMF - Enhanced Muscle Function

- PEMF increases cell energy and muscle mass. Optimal muscle energy allows muscle to work harder longer and harder, and recover quickly. Muscles that are contracted or in spasms are better able to relax, reducing tension and pain associated with spasms.

PEMF - Stress Reduction

- Stress is part of life. Normal stress (called eustress) is necessary for survival. Too much stress is very harmful to the body and accelerates aging, increasing the risk for injury and delayed recovery. It is said that stress is responsible for at least 65% of our illness, so stress reduction is necessary for all of us. Magnetic fields have many stress reducing effects, helping our bodies deal with and recover from excessive stress.

PEMF - Reduced Pain and Inflammation

- PEMF has been shown to be effective at reducing acute and chronic pain both short term and long term. This occurs due to changes in the trans-membrane potential of the cells. This increased cellular membrane flexibility allows for an influx of calcium, sodium, potassium and chloride ion exchange across the cell membrane channels. This depolarizes membranes, increasing nerve transmission while reduces pain signals. PEMF also reduces inflammatory chemical compounds similar to that of non-steroidal anti-inflammatory medications, without the liver and kidney side effects. ***Safe Natural Pain Relief.***

PEMF – Accelerates Bone Healing

- PEMF works as a catalyst to increase bone density and improve healing rates. PEMF stimulates bone cells to proliferate, differentiate and mineralize. PEMF has been shown to improve the quality of bone tissue and enhance bone preservation, whether they are damaged by surgery, injury or disease. PEMF increases the calcium binding chemicals within both damaged and healthy bones. This will accelerate healing of fractures as well to improve bone regeneration and increase bone density in fractures and osteopenia – osteoporosis.

Improved Tissue Repair

- Improved Tissue Repair means faster healing and recovery time.
- Regulates immune cell signaling mechanisms to promote tissue regeneration8
- Treatment for inflammatory regulation to be used to promote tissue regeneration8
- 59% increase in the tensile strength of the treated wound and a 69% increase in the tensile strength of the tendon (9)
- Muscle Relaxation
- Improved Circulation helps to relax muscles and decreases lactic acid buildup.
- Increased flow of ions that promote relaxation such as Calcium (10)
- Reduces the physiological deficits associated with Delayed Onset Muscle Soreness (12)

Improves Mitochondrial Function

- Cells function and create energy more efficiently and are less prone to diseases and malfunction.
- Enhanced brain mitochondrial function by 50-150% across six established measures, being greatest in cognitively important brain areas (13)

Improved Immune Function

- Poor regulation of inflammatory/immune function can allow acute-phase inflammatory response to become chronic, initiating disease and inhibiting tissue regeneration.
- Achieving homeostasis in the face of acute inflammatory/immune challenges in the human body involves maintaining a balance of highly complex biochemical and cellular interactions. When this delicate balance is upset, acute inflammatory and immune responses designed to quickly eliminate a transient threat become chronic, and inflammatory and/or autoimmune disease sets in. PEMF has the potential to regulate this very delicate balance. (8)
- By restoring normal Ca2+ ion flux and Na+/K+ balance, the cell can begin the process of down-regulating inflammatory cytokines (7)

Increase in Antioxidants

- Antioxidants help to stabilize free radicals. Free radicals cause early cell death, and lead to early aging with chronic diseases such as cancer.
- Increase in antioxidant enzymes activity; CAT, SOD (SOD1 and SOD2), and glutathione peroxidase (GPx1 and GPx4) (14)

Reduce Oxidative Stress

- When your cells are not receiving enough Oxygen (inflammation) Oxidative Stress occurs and free radicals are produced.
- Decreased the level of parameters of oxidative stress (14)
- Act on radical production and in medium with oxygen also to radical oxygen species (ROS) (15)
- Protect the liver from oxidative stress injury by decreasing MDA and GSSG level, promoting reduced GSH level, and increasing GSH-Px activity and expression (16)
- Modulate defenses against Reactive Oxygen Species (17)

Improved Cartilage production

- Cartilage allows your joints to move smoother, and act as a cushion at the ends of your bones where they connect to joints.
- Increased the synthesis of the major component of cartilage matrix, known as proteogylcans18 c Stimulate proliferation of healthy human chondrocytes (19)
- Enhance IGF-1 expression, which participates in chondrocyte metabolism (20) Collagen is increased: 3 weeks of 2 h per day PEMF therapy increased the expression of GAG & Coll II (21)
- Helps to downregulate MMP13 expression of knee joint cartilage (22)
- Increase production of collagen, the major differentiated function of fibroblasts (23)
- Cellular Proliferation and DNA Synthesis
- DNA Synthesis is the most essential part for biological inheritance. Cellular proliferation is the creation of new cells, essential to life.
- Stimulate cellular proliferation and DNA synthesis through opening of voltage-sensitive calcium channels (24)

Apoptosis

- Programmed cell death (apoptosis) occurs naturally, and is a function of the body to guard against malfunctioning cells. However, this can also occur due to free radicals running rampant. When this occurs, necrosis follows if left unchecked, and diseases such as cancer.
- Suppress cartilage degeneration via the inhibition of chondrocyte apoptosis by increasing the expression of anti-apoptotic proteins (20)
- Affects induction of apoptosis (25)
- Decreases the elevated levels of ER chaperons Grp94, PDI and the apoptosis marker CHOP in human liver carcinoma cell lines (28)
- Decrease of measured cell death parameters (early and late apoptosis as well as necrosis) (9)

Stem Cells

- Stem Cells serve as a repair system for the body. c Increase the beneficial effect of chondrogenic differentiation from stem cells (20)
- Important role in promoting the osteogenic differentiation of human bone marrow stem cells (BMSCs) (26)

Neovascularization

- Formation of new blood vessels.
- Significantly increased neovascularization (9)
- Positive and restorative effect on proangiogenic molecules such as VEGF10 Nerve Regeneration
- Regrowth of nerve fibers (axons) is essential to repair and functional recovery of the spinal cord.
- Reduced nerve growth factor-like activity and levels (in doing so), may act on brain derived neurotrophic factor, ciliary neurotrophic factor insulin-like growth, fibroblast growth factor , and glia-derived neurotrophic factor (27)

Conditions Improved With PEMF

Arthritis

- Not only alleviates the pain in the arthritis condition but it also affords chondro-protection, exerts anti-inflammatory action and helps in bone remodeling and this could be developed as a viable alternative for arthritis therapy (30)

Degenerative Joint Disease (DJD)

- Improve clinical scores and function in patients with osteoarthritis of the knee and should be considered as adjuvant therapies in their management (31)
- After 1 month, PEMF induced a significant reduction in VAS pain and WOMAC scores compared with placebo.
- Pain tolerance and physical health improved in PEMF-treated patients. Twenty-six per cent of patients in the PEMF group stopped NSAID/analgesic therapy. No adverse events were detected (32)
- Improve bone and cartilage turnover in an animal model of OA (33)
- Data strongly support the clinical use of PEMFs in OA patients (34)
- Increased the Osteoarthritis chondrocytes (35)
- A two sample Student's t-test comparing change in knee-related pain, stiffness, and physical function for PEMF-treated leg vs control leg showed a significant difference in favor of PEMF therapy (36)

Tendonitis/Carpal Tunnel

- Carpal Tunnel - Reduction in pain, improvement in the electrophysiological studies, and handgrip strength. There are no reported side effects, discomforts, or known health risks (37)
- There was objective improvement in nerve conduction, and subjective improvement on examination and pain scores (38)
- Tendonitis - Enhance Ca(2+) binding in the growth factor cascades involved in tissue healing, achieved a marked increase of tensile strength (9)

Pain Reduction

- Neck Pain - pain severity declined by the end of the first day and continued to decline throughout the seven days of treatment; over the entire week, pain levels were lower than in the sham group (39)
- Safe for domiciliary use and this study suggests that PEMT has a beneficial effect in the management of the acute whiplash injury (75)
- Post Operative Pain : Associated with trends for a reduction in pain, compared to sham treatment(40)
- Effective for pain management in both simple and complex surgeries (41)
- Considerable and statistically significant potential for reducing pain in cases of lumbar radiculopathy and the whiplash syndrome (42)
- Pain had decreased in the active cohort by nearly a factor of three times that for the sham cohort (9)

Oncology/Cancer

- Inhibit cancer growth (43)
- Inhibit angiogenesis in tumor tissues, suppressing tumor vascularization and reducing tumor growth (43)
- Increase in tumor necrosis factor alpha levels that induce an anti-tumoral response (43)
- Slower tumor growth rate if compared with untreated control group44 c Increased Drug Uptake (2 Fold) to Tumor Cells (45)
- Increase effectiveness of treatments for Cancer when PEMF is used at the same time drugs are administered (45)
- Daily PEMF was found to retard angiogenesis and growth of a human breast cancer xenograph causing the tumor CONDITIONS IMPROVED WITH PEMF 15 to develop proportionately larger areas of necrosis and hypoxia and smaller areas of proliferative active cancer cells (46)
- In combination with Gamma Irradiation, there were significantly fewer lung metastatic sites and slower tumor growth than did untreated mice (47)
- Exhibited a potentiation of the antitumor effect of mitomycin (48)

Migraines

- Significant improvement in the days and duration of headaches, work-loss hours and number of medications (49)
- Exposure of the inner thighs to pulsing electromagnetic fields for at least 3 weeks is an effective, short-term intervention for migraine (50)

Stroke

- Protective effect of PEMFs on hypoxia damage in neuron-like cells which suggest a potential therapeutic approach in cerebral ischemic conditions (2)
- Improves motor condition as well as mental efficiency. PEMF significantly boosts the effectiveness of rehabilitation (14)
- Reduced ischemic neuronal damage in the most anterior coronal level by 69% and by 43% in the striatum. Implications for the treatment of acute stroke (54)
- Effective treatment for patients after traumatic or ischemic brain injury 55 and no effects on hormonal and sexual function or any side effects (51)

Diabetic Retinopathy

- Patients were treated over a 6-week period. 76% of the patients had a reduction in the level of numbness and tingling (53)

BPH / Prostate

- Reduce Prostate Volume after 28 days of therapy. Symptoms improved in a short time, with high compliance and no effects on hormonal and sexual function or any side effects (51)
- PEMF and exercise therapy is beneficial in the treatment of BPH (52)

Alzheimers/Dementia

- Long-term exposure to high frequency electromagnetic field treatment not only prevents or reverses cognitive impairment in Alzheimer's transgenic mice, but also improves memory in normal mice. This could have profound value in the disease's prevention and treatment through intervention at the mitochondrial level (56)

Depression

- Improve effectiveness of anti-depressants (57)
- Showed a clinically and statistically significant better outcome than patients treated with sham T-PEMF, with an onset of action within the first weeks of therapy. Effect size on the Hamilton 17-item Depression Rating Scale was 5% confidence interval .21–1.02). (62)
- Treatment-emergent side effects were few and mild (57)

Insomnia

- Seventy percent of the patients given active treatment experienced substantial or even complete relief of their Insomnia complaints (58)

Ununited Fractures

- More successful than noninvasive traditional management and at least as effective as surgical therapies (59)
- Treat patients suffering from delayed fracture healing and nonunions (60)

Chronic Low Back Pain/Non-specific Low Back Pain

- Decreased the level of pain and improved the function in subjects61 c Safe and effective in improving function in patients with non-specific LBP.(62)
- Adding pulsed electromagnetic field to Conventional physical therapy Protocol yields superior clinical improvement in pain, functional disability, and lumbar ROM in patients with non-specific low back pain (63)
- Decrease pain, LBP disability, increase lumbar spine mobility, and improve HRQOL in middle-aged university's employees with nonspecific LBP (64)

Tennis Elbow (Lateral Epicondylitis)

- Pain during exercise and when bending the wrist was significantly reduced. The study results confirmed that pulsed magnetic therapy quickly reduces pain caused by so-called golf or tennis elbow.(65)
- Effective in decreasing pain and improving function in participants with LE. (66)

Osteoporosis

- Prevent bone loss and improve lipid metabolism disorders (67)
- Stimulate osteoblastogenesis, suppress osteoclastogenesis, and influence the activity of bone marrow mesenchymal stem cells (BMSCs) and osteocytes, ultimately leading to retention of bone mass and strength (60)
- May have clinical application in the prevention and treatment of osteoporosis (68)

Rheumatoid Arthritis

- Emerging as a novel and highly promising means of treating chronic inflammation and aberrant immunity that exists in diseases such as RA7
- The positive role of pulsed electromagnetic field (PEMF) therapy in rheumatoid arthritis (RA) is known. Varying effects of the therapy in alleviating the different symptomatologies indicate that the rheumatoid factor (RF) is more resistant to PEMF

Nonalcoholic Fatty Liver Disease

- Increase antioxidant enzymes activity and alleviate lipid accumulation in fatty liver (16)

Sciatica

- Could be considered as an effective, safe and tolerable treatment for peripheral nerve repair in clinical practice (27)

Bone Remodeling

- Helps in bone remodeling (69)

Analgesic Use

- The net reduction in pain on the VAS was equivalent to a low to moderate dose of opioid analgesic in PEMF-exposed patients. when an opiate such as morphine is used in combination with PEMF, the side effects of the opiate may be reduced (39)
- Analgesic use during the first 24 hours after C-section was 1.9-times lower in the active-PEMF group. The total analgesic use during the seventh postoperative days was 2.1-times lower in the active-PEMF group than in the sham group (70)
- Effective in rapidly reducing use of narcotic medications (41)
- Patient use of postoperative pain medication correspondingly also decreased nearly three times faster (9)

Mobility and Function

- Improved mobility, pain scores, and energy level in fibromyalgia and chronic musculoskeletal pain patients (72)
- Beneficial effects on the pain, exteroceptive sensation, range of motion, and daily functioning of patients (73)

Overactive Bladder Syndrome

- In patients with neurogenic Overactive Bladder Syndrome induced an inhibitory effect on neurogenic detrusor overactivity (74)

Post-Operative Recovery

- Typically used for postoperative pain management with the expectation of a significant reduction in the use of narcotics and/or nonsteroidal anti-inflammatory drugs, earlier hospital discharge, and/or an earlier return to function14 c Postoperative pain was significantly lower in all the measured periods within the early and the late postoperative periods. Fewer experienced severe postoperative pain within 24 hours postoperatively (70)
- Seven days postoperatively, patients in the active-PEMF group had better wound healing with no exudate, erythema, or edema (70)
- Effective in rapidly reducing post-operative pain. (41)

Non Healing Wounds

- In the treatment of chronic non-healing wounds, the recommended treatment is 30 minutes twice per day until the wound is closed. Closure of chronically open wounds may be seen in 6 to 10 weeks with this treatment. (9)

Herniated Disk

- Potential therapy to protect tissue from the high inflammatory cytokine environment during disc degeneration (71)

Lumbar Fusion

- Fusion succeeded in 97.6% of the PEMF group and in 52.6% of the unstimulated group. The observed agreement between clinical and radiographic outcome was 75%. The use of PEMF stimulation enhances bony bridging in lumbar spinal fusion (44)

PEMF Classification

PEMF is classified as a Class II device, meaning no specific medical claims are made. This also means there is no special license or training required for its purchase or use. It is not intended to diagnosis or treat any specific condition, but rather help to increase natural cell function and energy. PEMF is often called cellular exercise because of the pulsing or pumping of fluids into the cells and muscle contractions often felt. Within PEMF, there is low power or micro-power and high power PEMF.

PEMF Side Effects

There are no side effects to PEMF therapy. PEMF passes thru health tissues. However, some the patients might feel some muscle soreness or tingling due to improved circulation, but this is not a contraindication. It is recommended to increase water intake and if posible add addition minerals.

PEMF Contraindications

Do not use PEMF on anyone with implanted electrical devices including pacemakers, cochlear implants, intrathecal pumps, etc., cannot use PEMF because the magnetic field can disable or shut the devices off. Persons with active bleeding or hemorrhaging conditions or during heavy menstruation cannot use PEMF. PEMFs have not been proven safe for pregnant women. People with organ transplants on immunosuppression or epilepsy should not use PEMF.

But that leaves an extremely large population that can benefit safely from PEMF. The sheer volume of potential patients that are eligible for treatment make this a valued treatment option for a wide variety of the population.

Contraindications to PEMF: **DO NOT use PEMF** if you are *pregnant, have a pacemaker, defibrillator, cochlear hearing device, insulin pumps, actively bleeding or have blood clots or after recent surgery.* Always consult with your healthcare provider.

Caution: Always remove any battery powered or electrical appliances such as cell phone, watch, car keys, credit cards to avoid any possible issues with PEMF energy.

"Based on research that was done at YALE UNIVERSITY, it is apparent that just about Any Pathology in the body is preceded by a DROP IN CELL ELECTRICAL CHARGE.

Now we have technology with PEMF that will reach down to the level of the cell that has lost charge and, due to the high intensity of the pulse, bring that pulse back to normal or a more normal situation, which allows it to replicate and produce a more normal cell."

A common cause of confusion regarding Pulsed Electromagnetic Field (PEMF) therapy is that it is associated with the harmful ***Electromagnetic Fields (EMFs)*** that are present within the environment. However, the pulsed electromagnetic fields differ from the harmful electromagnetic fields in several ways. Magnetic frequencies help to regulate several processes of the human body. In fact, our bodies even produce their own magnetic fields. However, when artificial and harmful electromagnetic fields enter your body, such as those from cell phone service or power lines, they can disrupt the way your body naturally works, creating an imbalance. This can cause changes to any of the natural systems within your body, from your stress levels to your sleep cycles, to your DNA. This imbalance may also make your body more susceptible to disease.

Beyond the effects of these electromagnetic fields on your body, the differentiating factors, or what actually makes one frequency harmful, and the other beneficial are the exposure time, the wavelength, and the frequency. Harmful electromagnetic fields have been recognized in various research studies to have significantly higher frequencies and lower wavelengths than therapeutic PEMFs. Most PEMF devices use low frequencies and long wavelengths, ranging from 1 to 10,000 Hertz, and do not produce any heating action. In comparison, a microwave, which produces harmful EMFs can use frequencies in the range of 100,000,000 Hertz.

The demand is increasing for effective natural treatment option without harmful side effects of drugs. Diabetic patients have seen reduced pain from neuropathy with PEMF stimulation of nerve cell repairing in a matter of weeks. Athletes and body builders use PEMF to get better focus and performance before an event and immediately after to maximize the speed of recovery of sore muscles, tissues and ligaments.

PEMF is a non-invasive, drug free method to create increased micro-circulation, muscle stimulation, and long term pain relief that helps you return to a normal, active lifestyle.

It is also used as a wellness and recovery therapy for athletes.

RESEARCH - 10,000 Research papers & 2000 Published Studies

Below is just a sampling of some of the many published studies found in PubMed on PEMF - http://www.pubmed.gov

Ankle Sprains - Military Medicine PMID: 8441490
Acutely sprained ankles represent a frequent and common injury among active duty troops in training, and are a significant source of morbidity with respect to days lost to training. In a randomized, prospective, double blind study of 50 grade I and II (no gross instability) sprained ankles, a statistically significant decrease in edema was noted following one treatment with pulsed electromagnetic field (PEMF) therapy. The application of this modality in acutely sprained ankles could result in significant decreases in time lost to military training.

Back Pain - Neuro Rehabilitation PMID: 12016348 - Back pain and the whiplash syndrome are very common conditions involving tremendous costs and extensive medical effort. A quick and effective reduction of symptoms, especially pain, is required. Magnetic fields appear to have a considerable and statistically significant potential for reducing pain in cases of lumbar radiculopathy and the whiplash syndrome.

Low Back Pain - Research PMID: 16749411 - This randomized, double-blind, placebo-controlled clinical trial studied the effectiveness of pulsed electromagnetic therapy (PEMT) in patients with chronic lower back pain. PEMT produced significant pain reduction throughout the observation period compared with baseline values. The percentage change in the NRS score from baseline was significantly greater in the PEMT group than the placebo group at all three time-points measured. The mean revised Oswestry disability percentage after 4 weeks was significantly improved from the baseline value in the PEMT group, whereas there were no significant differences in the placebo group. In conclusion, PEMT reduced pain and disability and appears to be a potentially useful therapeutic tool for the conservative management of chronic lower back pain.

Low Back Pain - Journal of International Pain Practice PMID: 17714104 - We evaluate the efficacy and safety of therapeutic electromagnetic fields (PEMF) on chronic low back pain. Secondary objectives included the investigation of the effects of PEMF on psychometric measures. Both groups improved over time. Although groups were similar during the treatment period, treated subjects (PEMF of 15 mT) improved significantly over sham treatment during the 2-week follow-up period (20.5% reduction in pain); there were no reported serious adverse events. This study demonstrates that PEMF may be an effective and safe modality for the treatment of chronic low back pain disorders.

Bone Healing - BMC Musculoskel. Disord. 2013 PMID: 23331333 Fracture patients treated with an early application of PEMF achieved a **significantly** increased rate of union and an overall reduced suffering time compared with patients that receive PEMF after the 6 months or more of delayed union.

Stimulation Of Bone Formation And Fracture Healing With Pulsed Electromagnetic Fields: Biologic Responses And Clinical Implications - International Journal Of Immunopathology And Pharmacology Vol. 24, no. I (S2), 17-20 2011 - **PEMF exerts its beneficial effect on fracture biology** through an impressive wealth of mechanisms and pathways.

Bone Density - The Journal of Bone and Mineral Research PMID: 2195843
The data suggest that properly applied PEMFs, if scaled for whole-body use, PEMF may have clinical application in the prevention and treatment of osteoporosis.

Cartilage - Knee Surgery, Sports Traumatology, Arthroscopy PMID: 17333120
Severe joint inflammation following trauma, arthroscopic surgery or infection can damage articular cartilage, thus every effort should be made to protect cartilage from the catabolic effects of pro-inflammatory cytokines and stimulate cartilage anabolic activities. Previous pre-clinical studies have shown that pulsed electromagnetic fields (PEMFs) can protect articular cartilage from the catabolic effects of pro-inflammatory cytokines, and prevent its degeneration. The percentage of patients who used NSAIDs was 26% in the active group and 75% in the control group. At 3 years follow-up, the number of patients who completely recovered was higher in the active group compared to the control group. Treatment with I-ONE aided patient recovery after arthroscopic surgery, reduced the use of NSAIDs, and also had a positive long-term effect.

Chronic Pain - Pain Research & Management PMID: 16770449
Specific pulsed electromagnetic fields (PEMFs) have been shown to induce analgesia (anti-nociception) in healthy human volunteers. These findings provide some initial support for the use of PEMF exposure in reducing pain in chronic pain populations and warrants continued investigation into the use of PEMF exposure for short-term pain relief.

Knee Pain - Alternative Therapies in Health and Medicine PMID: 11565402
Low-amplitude, extremely low frequency magnetic fields are safe and effective for treating patients with chronic knee pain due to osteoarthritis. Reduction in pain after a treatment session was significantly greater in the magnetic field-on group (46%) compared to the magnetic field-off group (8%).
Knee Arthritis - Wiener Klinische Wochenschrift PMID: 12602111
In patients with symptomatic osteoarthritis of the knee, PMF treatment can reduce impairment in activities of daily life and improve knee function.

Erectile Dysfunction - Vopr Kurortol Fizioter Lech Fiz Kult PMID: 17882824
Combined treatment with local negative pressure and pulsating magnetic field conducted in 116 patients with erectile dysfunction aged 20-60 years produced optimal treatment results. Recovery and improvement of the erectile function were achieved in 85.7% patients given local vacuum magneto-therapy.

Erectile Dysfunction - Lik Sprava PMID: 8819933
An effect was studied of appliances for magneto-therapy on sexual function of 105 men presenting with sexual problems. A total of 96 patients were examined according to a general program, to study placebo-effect. The magnetic field beneficial effect was recordable in 70-80 % of the patients, that of placebo in 33 % men. It is suggested that augmentation of sexual activity is associated with an increase in cavernous blood flow.

Myofascial Pain - Clinical Neurophysiology PMID: 12559244
The repetitive magnetic stimulation (rMS) group showed a significant improvement in VAS, NPDVAS, algometry, as well as in the characteristics of the therapy device after conclusion of treatment. Improvements in the ROM were also present in rotation and contralateral bending. This improvement persisted after 1 month. On the other hand, the placebo group did not show any significant improvement in the tests considered. The results of this study show that peripheral repetitive magnetic stimulation (rMS) may have positive short- and medium-term therapeutic effects on myofascial pain.

Neck Pain - Annales de Readaptation et de Medicine Physique PMID: 17229483
Patients' with chronic neck pain preferences were for pulsed electromagnetic field (PEMF). At 6 months, in the PEMF group, 33 patients were improved, 5 not improved and 4 lost to follow-up. In the spa therapy group, 24 patients were improved, 14 not improved and 6 lost to follow-up, for significantly greater improvement in the PEMF than spa therapy group (p=0.02). Significant improvement was seen in both groups in terms of pain score, Copenhagen scale score and score on some dimensions of the MOS SF-36 survey. PEMF seems to be superior to standard spa therapy group without massage in control of neck pain. The difference between groups, although perhaps biased, seems to suggest the importance of our conclusions.

Neuralgia - International Association for the Study of Pain PMID: 12927617
Pulsed radiofrequency treatment has been described as a minimal invasive alternative to radio-frequency thermocoagulation for the management of chronic pain syndromes. We present here our first five high-risk patients with idiopathic trigeminal neuralgia who were treated with pulsed radiofrequency after multidisciplinary assessment; with a mean follow-up of 19.2 months (range 10-26). These patients were at high risk due to age, co-morbidities or previous interventional and surgical treatments. An excellent long-term effect was achieved in three of the five patients, a partial effect in one patient and a short-term effect in one patient. No neurological side effects or complications were reported.

Osteoarthritis - Journal of Rheumatology PMID: 8478852
An average improvement of 23-61% occurred in the clinical variables observed with active treatment, while 2 to 18% improvement was observed in these variables in placebo treated control patients. No toxicity was observed. The decreased pain and improved functional performance of treated patients suggests that this configuration of PEMF has potential as an effective method of improving symptoms in patients with OA. This method warrants further clinical investigation.

Osteoarthritis - Knee/Cervical Spine - Journal of Rheumatology PMID: 7837158
We conducted a randomized, double blind clinical trial to determine the effectiveness of pulsed electromagnetic fields (PEMF) in the treatment of osteoarthritis (OA) of the knee and cervical spine. Matched pair tests showed extremely significant changes from baseline for treated patients in both knee and cervical spine studies at the end of treatment and the one month follow up observations, whereas the changes in the placebo patients showed lesser degrees of significance at the end of treatment. PEMF has therapeutic benefit in painful OA of the knee or cervical spine.

Pain - Pain Medicine PMID: 18777606
PEMF exposure in refractory CTS provides statistically significant short- and long-term pain reduction and mild improvement in objective neuronal functions. Neuromodulation appears to influence nociceptive-C and large A-fiber functions, probably through ion/ligand binding.

Rotator Cuff Tendonitis - The Lancet PMID: 6143039
The value of pulsed electromagnetic fields (PEMF) for the treatment of persistent rotator cuff tendonitis was tested in a double-blind controlled study in 29 patients whose symptoms were refractory to steroid injection and other conventional conservative measures. At the end of the study 19 (65%) of the 29 patients were symptom-less and 5 others much improved. PEMF therapy may thus be useful in the treatment of severe and persistent rotator cuff and possibly other chronic tendon lesions.

Tinnitus - Clinical Otolaryngology and Allied Sciences PMID: 8877185
At the end of one week of treatment, each patient noted whether their tinnitus had completely disappeared, was improved, unchanged or made worse by the treatment. 45% of the patients who completed the trial were improved by the active device, but only 9% by placebo). We suggest that electromagnetic stimulation may be an effective treatment in some tinnitus sufferers.

Wounds - Volpr Onkol PMID: 11147428 - Journal of Plastic and Reconstructive Surgery PMID: 19008935
Treatment for wounds included two modalities: standard medication and alternating or pulsating magnetic field. Magnetic therapy proved highly effective: wound healing was 3-3.5 times faster while duration of treatment was 2-3 times shorter than in standard procedure. Clinically-verified partial adhesion-related intestinal obstruction was eliminated by magnetic procedure in 18 children after combined treatment for lymphosarcoma involving the ileum.

Wounds - PEMF was used as an adjunct to basic wound care of 3 large, long-standing (6 years) stage III and IV pressure ulcers that were unresponsive to conventional therapy. The ulcer on the right foot healed within 4 weeks, the left heel ulcer reduced in size by 95% at 7 months, and the large sacral ulcer healed to closure in 11 months. Conclusion: Pulsed radio frequency energy treatment with basic wound care, if administered early in the course of pressure ulcer therapy, might avoid the lengthy hospitalizations and repeated surgical procedures necessary for treatment of uncontrolled ulcers, reducing the overall cost of treatment and improving the quality of life for chronically ill or injured patients.

PEMF Equipment Used

As of 2020, there were 47 different manufacturers of PEMF in the world. Most all are *very low or micro-power* PEMF mats or rings, some are multi-level marketing. Since the power is so low, the low energy does not penetrate the body very deeply and you typically do not feel much while using these low powered units. Even with daily use, it may take a long time to feel noticeable changes in pain or range of motion for some people. All PEMF works, but in a clinical setting, power and flexibility is vital to success. **As a Sports Chiropractor, I want and need to see RESULTS and FAST and so do my patients!**

There are only 5 US manufacturers of High Power PEMF. Once you experience the high power PEMF, you will notice profound effects ***IMMEDIATELY*****.** The higher power produces energy strong enough to affect deeply into the body and provide pain relief very quickly and shorter treatment times are needed. However, there is such a thing as too much power. Some Equine PEMF units are too strong for humans. Based on my experiences, the power balance & Dual Pulse technology & quality are the key.

POWER = DEPTH OF PENETRATION
HIGH POWER = SHORTER TREATMENT TIME
HIGH POWER = GREAT TISSUE SATURATION

High Power PEMF provides for deeper tissue penetration and more cellular membrane depolarization. This provides for more complete Blood circulation and tissue Oxygenation for better, noticeable results in only minutes. High Power PEMF reaches deep inside your body to exercise your cells. It causes them to expand and contract, as if one was working out at the gym. As your cells expand and contract through boosted voltage, they are able to expel toxins, absorb nutrients, grow, and reproduce more successfully than weak, low-voltage cells. Over time, these strong cells will create more strong cells!

How to Choose a PEMF Machine for Clinic Use?

There are many low power PEMF machines on the market priced from $1500-$6000, but low power is more of a home use, wellness device. With these very low power (0.3-0.8 gauss) you do not feel anything at all while using it and it may take days to weeks to notice any type of improvement. However, with High Power PEMF, (5400 – 30,000 gauss) you feel the powerful electro-magnetic energy immediately and see results in minutes! **Remember:** **POWER = PENETRATION.**

Because of my position in the busy military Sports clinics, I have spoken to, or meet with the PEMF manufacturers, owners, CEO's, National Sales managers, distributors, PEMF trainers and sales reps. As a result, I have had the opportunity to try, demo and use (for an extended period of time) several brands of both low power and high power PEMF in my busy military clinic. Based on my experience & clinic trials of several different brands of PEMF machines while working in the busiest U.S. Navy Sports Medicine clinic where I treat US Marines, I believe I have found the best clinical brands of PEMF.

What to Look for When Purchasing a PEMF Machine
Why Electrical Safety Certifications are Critical

Professionals and End Users in both the human and animal medical/therapy markets inquire about the validity and purpose of Electrical Safety Testing and Certifications on therapeutic devices offered with the purchase of therapeutic devices.

Medical Grade Electrical Safety Certificates are required for all X-Ray machines, Ultrasound devices, surgical tools, defibrillators, drug pumps, insulin pumps, and glucose monitors. Electrical Safety Standards for the Pulsed Electro-Magnetic Field devices are offered in any market, and what you may be buying is no different. It is crucial that all stakeholders involved in the manufacture and use of RFI-prone (also called radio-frequency interference) medical devices take all necessary steps to avoid serious RFI problems that may lead to safety hazards.

PEMF devices are definitively RFI devices. All PEMF device manufacturers are legally required, by the FDA, to design and test their products to ensure conformance with current RFI standards and educate users of their devices about the possible symptoms and safety concerns of potential RFI. All manufacturers must comply with the FDA, FCC and OSHA Regulations and go through the process of obtaining Electrical Safety Certifications through third party testing in accredited laboratories.

Note: ***Most of the high power PEMF manufacturers DO NOT Comply with this Law.***

After using several brands, I only work with and recommend the following high-quality companies who comply with U.S. government safety guidelines.

ReCharge PEMF / Zimmer Medical / Storz

If you wish to purchase these brands, please contact me directly for my special military discount.

Basically, since 2016, I have done the trials & research for you.
Why would you risk buying a brand that is not fully certified?

All imported therapeutic devices manufactured abroad certainly have to meet these U.S. safety standards to be sold in the U.S.. **Be aware of cheap China made copies & knock-offs.**

However, a word of caution. Only one of the High-Power PEMF manufacturer in the U.S. meets these required standards.

ReCharge PEMF is made in the USA in a certified manufacturing facilities with all the government safety required UL, CE, & ISO certifications, with Product Liability Insurance, and supports ongoing medical research studies using their own equipment.

None of the other U.S. manufacturers do this. Why? $$$

Distributors, resellers, and *the medical practices that purchase PEMF* devices must assure all consumers that what they are buying and employing for treatments are safe and compliant with applicable regulatory standards and requirements. High powered PEMF devices are used in a variety of medical and wellness environments, for both human and animal use, as well as for consumer home use. Ask your distributor or factory to show evidence that the devices you are buying (or reselling) have properly passed an Electrical Safety Test and have received Certification. Do they support ongoing clinical studies and research?

**A sample list of accredited laboratories are: Element, Intertek, TUV, United Labs, and Qai. At the very least manufacturers and their distributors should provide links to accredited labs where their PEMF devices have either passed or failed Electrical Safety Testing*.

My Recommended High Power PEMF Machines

PEMF BRAND NAME: ***Recharge PEMF*** **Model #10** **Portable DUAL Unit**

This is the best unit for my PEMF In Action - Active Rehab Program

The newest technology unit is All-Digital (No Spark Chamber, No maintenance)

* **Each unit has TWO INDEPENDENT PEMF Machines**

Power: 1.5 Tesla / 15,000 gauss, Two machines in one **case** allowing two attachments to run at the same time and can be synchronized to have both attachment pulse at the same rate at the same time.

Two Machines in One / Dual Frequency / Dual PEMF Machine
High Power / Digital / Solid State
Portable, weighs ***Only 18 Lbs*** (13.25" x 16.75" x 7")
My Military Clinical Package Includes:
1 Paddle, 1 butterfly loop, 1 single loop,
2 18 x 24 Pads for complete torso PEMF

Used by U.S. Marine Corps Special Forces Training Comand

PEMF BRAND NAME: ***Zimmer*** **High Energy Inductive Therapy (HEIT)**

Clinical Model **German Design & Manufactured**

30,000 Gauss / 3 Tesla (large applicator)
25000 Gauss / 2.5 Tesla (medium applicator)
2 Channels
Variable Frequency 1 - 150 Hz
20 Treatment Protocols
Treatment time 1-60 minutes
8" LCD touch screen
Dimensions
542 (L) × 501 (W) × 993 (H) mm
Weight 132 lbs

PEMF BRAND NAME: ***ReCharge PEMF*** **Model #6 Clinical Dual DoD CB-6**

All-Digital (No Spark Chamber, No maintenance)
A High Power Unit, but our lowest gauss of high power units, lower cost

Power: ***400 gauss to 5,220 gauss*** *(.5 Tesla)*

Two waves running simultaneously and able to use two attachments to run at the same time and can be synchronized to have both attachment pulse at the same rate at the same time.

Digital / Solid State weighs 9 Lbs
Clinical Package Includes:
1 Paddle, 1 butterfly loop, 1 single loop,
2 18 x 24 Pads for complete torso PEMF

Today, top Professional Trainers & Athletes in the NFL, NBA, and MLB use PEMF Therapy. After years of trials, I was successful in bringing PEMF into the military. Now the U.S. Navy Sports Medicine and U.S. Marine Corps Special Forces are using High Power **ReCharge PEMF** brand.

Remember, ReCharge PEMF is the only manufacturer with DUAL PULSE TECHNOLOGY
ReCharge PEMF is the Only American Made PEMF APPROVED & ALLOWED for Government /DoD/ Military purchase.

Having used many brands of PEMF and ShockWave, I can help you select the best unit for your personal or clinical needs and budget. One clinic patient per month will cover the lease payment, so this is an easy fit for any clinic.

Note: IRS Section 179 may allow business owners to deduct the full purchase price of qualifying equipment and software that was purchased or financed during the tax year, rather than depreciating it over the asset's useful life.

If you are looking to purchase, don't buy from a sales rep; invest and learn from an experienced clinician & colleague. I will train you how to use PEMF in Action.

Contact Dr. Larry Basch, D.C. 858-945-8118 LBASCHDC@gmail.com

This paper was organized and compiled by ***Dr. Larry Basch, D.C., CCSP, CCEP, ICSC*** **U.S. Marine Corps Sports Chiropractor / U.S. Naval Sports Medicine**
With over 30 years of clinical experience as a Board-Certified Chiropractor and having worked in 27 different clinics, I have treated tens of thousands of patients from infants to seniors to world champion power lifters, NFL & NBA professional athletes and rock n roll superstars. I am one of only 11 Chiropractors working on a Marine Corps base. In 2009, I was selected to work at the first full-time Chiropractic clinic at the Officers Candidate School, USMC, Quantico, VA. In 2010, I transferred to Twentynine Palms Naval Hospital, USMC, CA. Since 2011, I have been at the Navy Medicine Multi-Discipline Sports Medicine clinic at Camp Pendleton. I am one of only about 4000 Chiropractors to complete the post-graduate program Certified Chiropractic Sports Practitioner (CCSP) and be nationally certified by American Board of Chiropractic Sports Physicians. Additionally, I am a Certified Chiropractic Extremity Practitioner (CCEP) and International Certificate of Sports Chiropractor (ICSC). I have post graduate training from Olympic and Professional Sports Chiropractors. I have advanced certification in the treatment of whiplash injuries, spinal rehab, acupuncture and extensive training in Clinical Nutrition, Soft Tissue Injuries, Sports Injuries & Spinal Rehab, Laser and PEMF therapy as well as past employment as a Clinical Case Manager doing Insurance review for the nation's largest Chiropractic HMO. I am also a 10 yr Veteran of USMC and Illinois Army National Guard.

Dr. Larry Basch, D.C., CCSP, CCEP, ICSC U.S. Marine Corps Sports Chiropractor / U.S. Naval Sports Medicine

Due to my persistent efforts & over 4 years of trails, the U.S. Navy Sports Medicine Clinic receives the First ever High Power Clinical PEMF units in Dec 2020.

And due to my continued efforts in 2021, the U.S. Marine Corps – Recon Reconnaissance Training Company gets the First ever Portable PEMF unit.

This paper is for educational purposes only. Products featured in this paper or website have not been evaluated by the FDA and are not intended for use as medical devices. PEMF products are not intended to diagnose, treat or cure any diseases, illnesses, medical conditions, or injuries. If you are experiencing symptoms of any medical condition, you should seek the advice of your licensed healthcare provider immediately. The U.S. Government, U.S. Department of Defense, U.S. Navy, U.S. Marine Corps does not promote, nor endorse these paper or products discussed.

References for Physiological Effects & Benefits:

Provided by Michael Davis, PhD. Physics and Former NASA Scientist, PEMF Manufacturer & Expert

1. Tang X, Alliston T, Coughlin D, et al. Dynamic imaging demonstrates that pulsed electromagnetic fields (PEMF) suppress IL-6 transcription in bovine nucleus pulposus cells: PEMF SUPPRESS IL-6 TRANSCRIPTION IN NP CELLS. J Orthop Res. 2017. doi:10.1002/jor.23713
2. Vincenzi F, Ravani A, Pasquini S, et al. Pulsed electromagnetic field exposure reduces hypoxia and inflammation damage in neuron-like and microglial cells: PEMFs REDUCE HYPOXIA AND INFLAMMATION DAMAGE. J Cell Physiol. 2017;232(5):1200-1208.
3. Amin HD, Brady MA, St-Pierre J-P, Stevens MM, Overby DR, Ethier CR. Stimulation of chondrogenic differentiation of adult human bone marrow-derived stromal cells by a moderate-strength static magnetic field. Tissue Eng Part A. 2014;20(11-12):1612-1620.
4. Varani K, De Mattei M, Vincenzi F, et al. Characterization of adenosine receptors in bovine chondrocytes and fibroblast-like synoviocytes exposed to low frequency low energy pulsed electromagnetic fields. Osteoarthritis Cartilage. 2008;16(3):292-304.
5. Vincenzi F, Targa M, Corciulo C, et al. Pulsed electromagnetic fields increased the anti-inflammatory effect of A_2A and A_3 adenosine receptors in human T/C-28a2 chondrocytes and hFOB 1.19 osteoblasts. PLoS One. 2013;8(5):e65561
6. Fini M, Pagani S, Giavaresi G, et al. Functional tissue engineering in articular cartilage repair: is there a role for electromagnetic biophysical stimulation? Tissue Eng Part B Rev. 2013;19(4):353-367.
7. Ross CL, Ang DC, Almeida-Porada G. Targeting mesenchymal stromal cells/pericytes (MSCs) with pulsed electromagnetic field (PEMF) has the potential to treat rheumatoid arthritis. Front Immunol. 2019;10:266.
8. Ross CL, Zhou Y, McCall CE, Soker S, Criswell TL. The use of pulsed electromagnetic field to modulate inflammation and improve tissue regeneration: A review. Bioelectricity. 2019;1(4):247-259.
9. Strauch B, Herman C, Dabb R, Ignarro LJ, Pilla AA. Evidence-based use of pulsed electromagnetic field therapy in clinical plastic surgery. Aesthet Surg J. 2009;29(2):135-143.
10. Ganguly KS, Sarkar AK, Datta AK, Rakshit A. A study of the effects of pulsed electromagnetic field therapy with respect to serological grouping in rheumatoid arthritis. J Indian Med Assoc. 1998;96(9):272-275.
11. Bragin DE, Statom GL, Hagberg S, Nemoto EM. Increases in microvascular perfusion and tissue oxygenation via pulsed electro24 REFERENCES: magnetic fields in the healthy rat brain. J Neurosurg. 2015;122(5):1239-1247.
12. Jeon H-S, Kang S-Y, Park J-H, Lee H-S. Effects of pulsed electromagnetic field therapy on delayed-onset muscle soreness in biceps brachii. Phys Ther Sport. 2015;16(1):34-39.
13. Dragicevic N, Bradshaw PC, Mamcarz M, et al. Long-term electromagnetic field treatment enhances brain mitochondrial function of both Alzheimer's transgenic mice and normal mice: a mechanism for electromagnetic field-induced cognitive benefit? Neuroscience. 2011;185:135-149.
14. Cichon N, Synowiec E, Miller E, et al. Effect of rehabilitation with extremely low frequency electromagnetic field on molecular mechanism of apoptosis in post-stroke patients. Brain Sci. 2020;10(5):266.
15. Funk RH. Coupling of pulsed electromagnetic fields (PEMF) therapy to molecular grounds of the cell. Am J Transl Res. 2018;10(5):1260-1272.
16. Liu Y, Zhai M. Pulsed Electromagnetic Fields Alleviates Hepatic Oxidative Stress and Lipids Accumulation in db/db mice. bioRxiv. 2020. doi:10.1101/2020.04.06.028621
17. S. Ehnert, A. Fentz, A. Schreiner et al., "Extremely low frequency pulsed electromagnetic fields cause antioxidative defense mechanisms in human osteoblasts via induction of •O2− and H2O2," Scientific Reports, vol. 7, no. 1, Article ID 14544, 2017.
18. Zarins, Denise; Gifford, III, Hanson; Deem, Mark; Levin, Howard R.; Gelfand, Mark; Zadno, Nicolas, "Methods and apparatus for monopolar renal neuromodulation"
19. Fitzsimmons RJ, Gordon SL, Kronberg J, Ganey T, Pilla AA. A pulsing electric field (PEF) increases human chondrocyte proliferation through a transduction pathway involving nitric oxide signaling. J Orthop Res. 2008;26(6):854-859.
20. Ongaro A, Pellati A, Masieri FF, et al. Chondroprotective effects of pulsed electromagnetic fields on human cartilage explants. Bioelectromagnetics. 2011;32(7):543-551.
21. Chang S-H, Hsiao Y-W, Lin H-Y. Low-frequency electromagnetic field exposure accelerates chondrocytic phenotype expression on chitosan substrate. Orthopedics. 2011;34(1):20.
22. Luo Q, Li S-S, He C, He H, Yang L, Deng L. Pulse electromagnetic fields effects on serum E2 levels, chondrocyte apoptosis, and 25 REFERENCES: matrix metalloproteinase-13 expression in ovariectomized rats. Rheumatol Int. 2009;29(8):927-935.
23. Murray JC, Farndale RW. Modulation of collagen production in cultured fibroblasts by a low-frequency, pulsed magnetic field. Biochim Biophys Acta. 1985;838(1):98-105.
24. Bourguignon GJ, Jy W, Bourguignon LY. Electric stimulation of human fibroblasts causes an increase in Ca2+ influx and the exposure of additional insulin receptors. J Cell Physiol. 1989;140(2):379-385. 2
5. Kaszuba-Zwoinska J, Chorobik P, Juszczak K, Zaraska W, Thor PJ. Pulsed electromagnetic field affects intrinsic and endoplasmatic reticulum apoptosis induction pathways in MonoMac6 cell line culture. J Physiol Pharmacol. 2012;63(5):537-545.
26. Yin Y, Chen P, Yu Q, Peng Y, Zhu Z, Tian J. The effects of a pulsed electromagnetic field on the proliferation and osteogenic differentiation of human adipose-derived stem cells. Med Sci Monit. 2018;24:3274-3282.
27. Mohammadi R, Faraji D, Alemi H, Mokarizadeh A. Pulsed electromagnetic fields accelerate functional recovery of transected sciatic nerve bridged by chitosan conduit: an animal model study. Int J Surg. 2014;12(12):1278-1285.
28. Funk RH. Coupling of pulsed electromagnetic fields (PEMF) therapy to molecular grounds of the cell. Am J Transl Res. 2018;10(5):1260-1272.
29. Kaszuba-Zwoińska Jolanta, Chorobik Paulina, Nowak Bernadeta, Ziomber Agata, Juszczak Kajetan, Zaraska Wiesław, Thor Piotr, LPS Treatment and Exposure to PEMF induce Cell Death and Change in Secretory Activity of HMVEC-Bd with MM6 Cocultutre, Advances in Bioscience and Bioengineering. Vol. 2, No. 3, 2014, pp. 30-36. doi: 10.11648/j.abb.20140203.12
30. Ganesan K, Gengadharan AC, Balachandran C, Manohar BM, Puvanakrishnan R. Low frequency pulsed electromagnetic field--a viable alternative therapy for arthritis. Indian J Exp Biol. 2009;47(12):939-948..
31. Vavken P, Arrich F, Schuhfried O, Dorotka R. Effectiveness of pulsed electromagnetic field therapy in the management of osteoarthritis of the knee: a meta-analysis of randomized controlled trials. J Rehabil Med. 2009;41(6):406-411.
32. Bagnato GL, Miceli G, Marino N, Sciortino D, Bagnato GF. Pulsed electromagnetic fields in knee osteoarthritis: a double blind, placebo-controlled, randomized clinical trial. Rheumatology (Oxford). 2016;55(4):755-762.
33. Wang T, Xie W, Ye W, He C. Effects of electromagnetic fields on osteoarthritis. Biomed Pharmacother. 2019;118(109282):109282.
34. Fini M, Giavaresi G, Carpi A, Nicolini A, Setti S, Giardino R. Effects of pulsed electromagnetic fields on articular hyaline cartilage: review of experimental and clinical studies. Biomed Pharmacother. 2005;59(7):388-394.
35. De Mattei M, Caruso A, Pezzetti F, et al. Effects of pulsed electromagnetic fields on human articular chondrocyte proliferation. Connect Tissue Res. 2001;42(4):269-279. 26 REFERENCES:
36. Iannitti T, Palmieri B, Fistetto, Esposito, Rottigni. Pulsed electromagnetic field therapy for management of osteoarthritis-related pain, stiffness and physical function: clinical experience in the elderly. Clin Interv Aging. 2013:1289.

37. Kamel DM, Hamed NS, Abdel Raoof NA, Tantawy SA. Pulsed magnetic field versus ultrasound in the treatment of postnatal carpal tunnel syndrome: A randomized controlled trial in the women of an Egyptian population. J Adv Res. 2017;8(1):45-53.
38. Weintraub MI, Cole SP. A randomized controlled trial of the effects of a combination of static and dynamic magnetic fields on carpal tunnel syndrome. Pain Med. 2008;9(5):493-504.
39. Thomas AW, Graham K, Prato FS, et al. A randomized, double-blind, placebo-controlled clinical trial using a low-frequency magnetic field in the treatment of musculoskeletal chronic pain. Pain Res Manag. 2007;12(4):249-258.
40. Sorrell RG, Muhlenfeld J, Moffett J, Stevens G, Kesten S. Evaluation of pulsed electromagnetic field therapy for the treatment of chronic postoperative pain following lumbar surgery: a pilot, double-blind, randomized, sham-controlled clinical trial. J Pain Res. 2018;11:1209-1222
41. Rohde C, Hardy K, Ascherman J, Taylor E, Pilla A. PEMF therapy rapidly reduces post-operative pain in TRAM flap patients. Plast Reconstr Surg. 2012;130:91-92.
42. Thuile C, Walzl M. Evaluation of electromagnetic fields in the treatment of pain in patients with lumbar radiculopathy or the whiplash syndrome. NeuroRehabilitation. 2002;17(1):63-67.
43. Vadalà M, Morales-Medina JC, Vallelunga A, Palmieri B, Laurino C, Iannitti T. Mechanisms and therapeutic effectiveness of pulsed electromagnetic field therapy in oncology. Cancer Med. 2016;5(11):3128-3139.
44. Marks RA. Spine fusion for discogenic low back pain: outcomes in patients treated with or without pulsed electromagnetic field stimulation. Adv Ther. 2000;17(2):57-67.
45. Kranjc S, Kranjc M, Scancar J, Jelenc J, Sersa G, Miklavcic D. Electrochemotherapy by pulsed electromagnetic field treatment (PEMF) in mouse melanoma B16F10 in vivo. Radiol Oncol. 2016;50(1):39-48.
46. Cameron LS. Daily Pulsed Electromagnetic Field (PEMF) therapy inhibits tumor angiogenesis via the hypoxia driven pathway: therapeutic implications I. D.
47. Cameron IL, Sun L-Z, Short N, Hardman WE, Williams CD. Therapeutic Electromagnetic Field (TEMF) and gamma irradiation on human breast cancer xenograft growth, angiogenesis and metastasis. Cancer Cell Int. 2005;5(1):23.
48. Omote Y, Hosokawa M, Komatsumoto M, et al. Treatment of experimental tumors with a combination of a pulsing magnetic field and an antitumor drug. Jpn J Cancer Res. 1990;81(9):956-961.
49. Hatef B, Hashemirad F, Meftahi GH, et al. The efficiency of pulsed electromagnetic field in refractory migraine headaches: a randomized, single-blinded, placebo-controlled, parallel group. Int J Clin Trials. 2016;3(1):24. 27 REFERENCES:
50. Sherman RA, Acosta NM, Robson L. Treatment of migraine with pulsing electromagnetic fields: a double-blind, placebo-controlled study. Headache. 1999;39(8):567-575.
51. Tenuta M, Tarsitano MG, Mazzotta P, et al. Therapeutic use of pulsed electromagnetic field therapy reduces prostate volume and lower urinary tract symptoms in benign prostatic hyperplasia. Andrology. 2020;8(5):1076-1085. 52. Elgohary HM, Tantawy SA. Pulsed electromagnetic field with or without exercise therapy in the treatment of benign prostatic hyperplasia. J Phys Ther Sci. 2017;29(8):1305-1310.
53. Lau B., School of Medicine, Lomo Linda, USA. “Effect of Low Intensity Electromagnetic Fields on Diabetic Retinopathy”.
54. Grant G, Cadossi R, Steinberg G. Protection against focal cerebral ischemia following exposure to a pulsed electromagnetic field. Bioelectromagnetics. 1994;15(3):205-216.
55. Bragin DE, Statom GL, Hagberg S, Nemoto EM. Increases in microvascular perfusion and tissue oxygenation via pulsed electromagnetic fields in the healthy rat brain. J Neurosurg. 2015;122(5):1239-1247.
56. Dragicevic N, Bradshaw PC, Mamcarz M, et al. Long-term electromagnetic field treatment enhances brain mitochondrial function of both Alzheimer’s transgenic mice and normal mice: a mechanism for electromagnetic field-induced cognitive benefit? Neuroscience. 2011;185:135-149.
57. Bech P, Gefke M, Lunde M, Lauritzen L, Martiny K. The pharmacopsychometric triangle to illustrate the effectiveness of T-PEMF concomitant with antidepressants in treatment resistant patients: A double-blind, randomised, sham-controlled trial revisited with focus on the patient-reported outcomes. Depress Res Treat. 2011;2011:806298.
58. Pelka RB, Jaenicke C, Gruenwald J. Impulse magnetic-field therapy for insomnia: a double-blind, placebo-controlled study. Adv Ther. 2001;18(4):174-180.
59. Gossling HR, Bernstein RA, Abbott J. Treatment of ununited tibial fractures: a comparison of surgery and pulsed electromagnetic fields (PEMF). Orthopedics. 1992;15(6):711-719.
60. Wang T, Yang L, Jiang J, et al. Pulsed electromagnetic fields: promising treatment for osteoporosis. Osteoporos Int. 2019;30(2):267-276.
61. Galovic P, Celan D, Hernja-Rumpf T. Short term effect of PEMF magnetotherapy on chronic low back pain. J magn. 2018;23(4):553-558. 62. Lisi AJ, Scheinowitz M, Saporito R, Onorato A. A pulsed electromagnetic field therapy device for non-specific low back pain: A pilot randomized controlled trial. Pain Ther. 2019;8(1):133-140.
63. Elshiwi AM, Hamada HA, Mosaad D, Ragab IMA, Koura GM, Alrawaili SM. Effect of pulsed electromagnetic field on nonspecific low back pain patients: a randomized controlled trial. Braz J Phys Ther. 2019;23(3):244-249.
64. Elshiwi AM, Hamada HA, Mosaad D, Ragab IMA, Koura GM, Alrawaili SM. Effect of pulsed electromagnetic field on nonspecific low back pain patients: a randomized controlled trial. Braz J Phys Ther. 2019;23(3):244-249. 28 REFERENCES:
65. Alahmari K. Effectiveness of pulsed electromagnetic field therapy in the treatment of lateral epicondylitis – Pre-test post-test study. J Integr Health Sci. 2016;4(1):39.
66. Reddy R. Effect of pulsed electromagnetic field therapy on pain, pressure pain threshold, and pain-free grip strength in participants with lateral epicondylitis. Saudi J Sports Med. 2017;17(2):93.
67. Jiang Y, Gou H, Wang S, Zhu J, Tian S, Yu L. Effect of pulsed electromagnetic field on bone formation and lipid metabolism of glucocorticoid-induced osteoporosis rats through canonical Wnt signaling pathway. Evid Based Complement Alternat Med. 2016;2016:4927035.
68. Tabrah F, Hoffmeier M, Gilbert F Jr, Batkin S, Bassett CA. Bone density changes in osteoporosis-prone women exposed to pulsed electromagnetic fields (PEMFs). J Bone Miner Res. 1990;5(5):437-442.
69. Ganesan K, Gengadharan AC, Balachandran C, Manohar BM, Puvanakrishnan R. Low frequency pulsed electromagnetic field--a viable alternative therapy for arthritis. Indian J Exp Biol. 2009;47(12):939-948.
70. Khooshideh M, Latifi Rostami SS, Sheikh M, Ghorbani Yekta B, Shahriari A. Pulsed electromagnetic fields for postsurgical pain management in women undergoing cesarean section: A randomized, double-blind, placebo-controlled trial. Clin J Pain. 2017;33(2):142-147.
71. Tang X, Alliston T, Coughlin D, et al. Dynamic imaging demonstrates that pulsed electromagnetic fields (PEMF) suppress IL-6 transcription in bovine nucleus pulposus cells: PEMF SUPPRESS IL-6 TRANSCRIPTION IN NP CELLS. J Orthop Res. 2017. doi:10.1002/jor.23713
72. Overholt TL, Ross C, Evans RJ, Walker SJ. Pulsed electromagnetic field therapy as a complementary alternative for chronic pelvic pain management in an interstitial cystitis/bladder pain syndrome patient. Case Rep Urol. 2019;2019:5767568.
73. Krzyżańska L, Straburzyńska-Lupa A, Rąglewska P, Romanowski L. Beneficial effects of pulsed electromagnetic field during cast immobilization in patients with distal radius fracture. Biomed Res Int. 2020;2020:6849352.
74. Fergany LA, Shaker H, Arafa M, Elbadry MS. Does sacral pulsed electromagnetic field therapy have a better effect than transcutaneous electrical nerve stimulation in patients with neurogenic overactive bladder? Arab J Urol. 2017;15(2):148-152.
75. Foley-Nolan D, Moore K, Codd M, Barry C, O’Connor P, Coughlan RJ. Low energy high frequency pulsed electromagnetic therapy for acute whiplash injuries. A double blind randomized controlled study. Scand J Rehabil Med . 1992;24(1):51-59.

Reference Books, Websites, Papers:

Michael Davis, PhD Physics, Former NASA Scientist, PEMF Manufacturer
Supercharge Your Health with PEMF Therapy: William Pawluk, M.D., MSc. 2021
Power Tools For Health: William Pawluk, M.D., MSc. 2017
Healing is Voltage: Jerry Tennant, M.D., MDh, PSc.D. 2013
Power to Heal: Magnus Magnetica, Henry Siegal, 2015
Understanding PEMF: Jonathan Bowen
https://www.Pulsed Energy Technologies.com
https://www.drpawluk.com/category/education/
https://magdahavas.com/dr-oz-on-pemf-therapy-and-pain-control
https://www.ondamed.net/images/publications/MedicalPEMFStudies2.pdf
http://drgaryryan.com/pemf-related-research/

1. B. Jones, et al Medical Surveillance of Injuries in the US Military. Am J Prev Med 2010; 38 (1s) :S42-S60
2. The global burden of low back pain: the Global Burden of Disease 2010 study, Damian Hoy, et al., *Annals of the Rheumatic Diseases*
3. https://www.usbji.org/about/impact
4. Am J Prev Med 2010:38 S42-60
5. John Hopkins School of Public Health 2000)
6. https://www.thegoodbody.com/back-pain-statistics/#$50-billion-annually
7. https://www.cdc.gov/inchs/datainhsr/hhsr098.pdf
8. Griffin LY, Agel J, Albohm MJ, et al. Noncontact anterior cruciate ligament injuries: prevention. J Am Acad Orthop Surg. 2000;8 (3):141-50.
9. Noyes FR, Mooar PA, Matthews DS, Butler DL. The symptomatic anterior cruciate deficient knee. J Bone Joint Surg Am.1983; 65:154-62.
10. http://www.bmj.com/content/353/bmj.i2139/rapid-responses
11. https://www.ncbi.nlm.nih.gov/pubmed/23723142
12. http://americannutritionassociation.org/newsletter/deadly-nsaids
13. https://www.cdc.gov/drugoverdose/epidemic/
14. https://www.opensecrets.org/lobby/clientsum.php
15. https://www.drugwatch.com/manufacturer/
16. W. Pawluk; Power Tools for Health, pg 56
17. J. Tennant, Healing is Voltage; 2013
18. Goodwin, Thomas J (2003) Physiological & Molecular Genetic Effects of Time-Varying Electromagnetic Fields on Human Neuronal Cells. Lyndon B. Johnson Space Center
19. Effect of Pulse Magnetic Field Stimulus on Blood Flow using Digital Infrared Thermal Imaging. Lee Hyun Sook. J Korean Magnetics Society,2009
20. Ganesan et al (Department of Biotechnology, Chennai, India) The Clinical Rheumatology Journal, volume 26-1, January 2007, October 2011, 21 (5), 180-184.
21. Pulse; Pulse centers PEMF Research Behind the results.

Contact Dr. Larry Basch, D.C. 858-945-8118 LBASCHDC@gmail.com

End

