



# THE SCIENCE BEHIND PEMF

2021 Edition

# PEMF RESEARCH

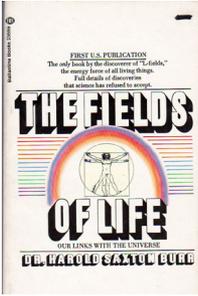
The use of Pulsed Electromagnetic Fields (PEMF) for wellness dates back to the 19th century, and the scientific studies regarding the benefits and applications of PEMF are extensive, to say the least. While this compilation is merely a subset of the extensive research regarding PEMF, it is a great starting point for learning more about the science that backs this incredible technology. This document will take you on a journey through early research around why and how PEMF works and further into the general wellness benefits that PEMF has been shown to provide - both for people and animals.

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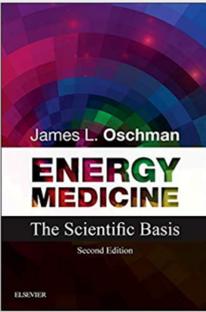
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*The information presented in this brochure is for your information only and is not a substitute for professional health advice. All Pulse products are meant for general wellness and have not been evaluated by the FDA. If you are experiencing symptoms of a physical or medical condition, you should seek the advice of a licensed medical professional immediately.*

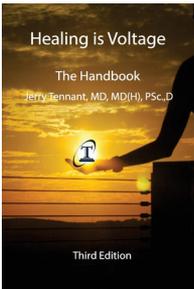
# EARLY DISCOVERIES AND PUBLICATIONS



Harold Saxton Burr, Professor of Anatomy at Yale University, studied the predictive electromagnetic fields produced by the bodies of humans and animals and detailed his findings in publications such as *The Fields of Life*, *The Electric Patterns of Life*, and *Blueprint for Immortality*.



In 2001, Professor James L. Oschman compiled the extensive research-based evidence around energy as a driver of normal health and wellbeing. His book *Energy Medicine: The Scientific Basis* makes the case for energy-based modalities as fundamental components of health & wellness regimens.



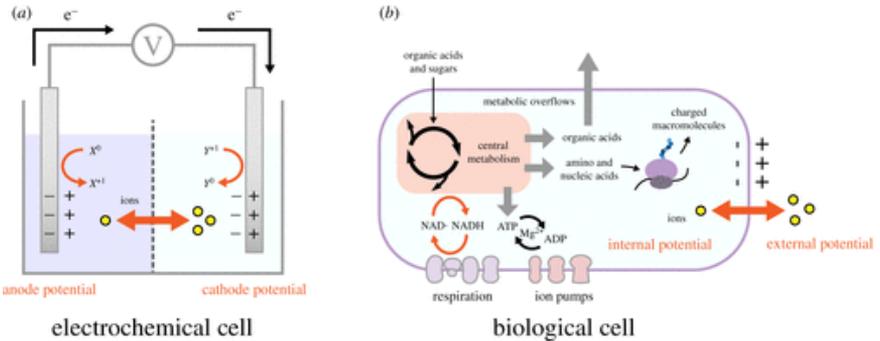
In 2010, world-renowned physician, international author, and integrative health practitioner Jerry Tennant, MD released the first edition of his book *Healing is Voltage* in which he explored the relationship between voltage across cell membranes and wellness.

*"With enough voltage and raw materials, the body can heal almost anything." - Dr. Jerry Tennant*

# CELLS ARE LIKE BATTERIES

Bioelectrical Understanding and Engineering of Cell Biology

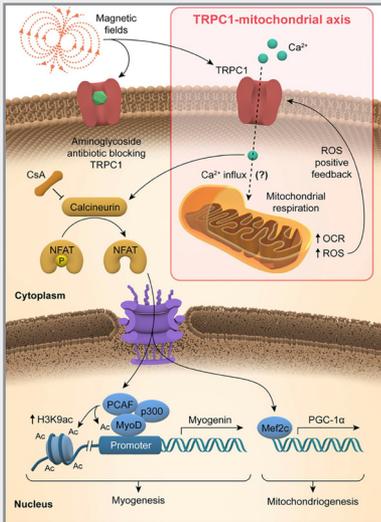
(Journal of the Royal Society, 2020)



Researchers from the University of Warwick's Bio-Electrical Engineering Innovation Hub explained that a bioelectrical view of the cell could enhance our ability to predict and control cellular behavior. In both electrochemical cells (batteries) and biological cells, the partitioning of charged molecules and ions across membranes in and around the cell gives rise to chemical reactions and ion movements. We know that when batteries are low on charge, they perform short of their potential. Similarly, biological cells that are low on charge will also exhibit dysfunction. Much like

rechargeable batteries for cell phones, laptops, and cars, biological cells can also be recharged to function optimally. We can also expect that just as some rechargeable batteries hold their charges less as they age, the duration or impact of recharging biological cells will vary from one cell/individual to the next.

*"The bioelectrical conceptualization of cell behaviour can be illustrated with an analogy between a biological cell and a battery, both of which use redox reactions and ion movements."*



## HOW PEMF WORKS: THE MECHANISM OF ACTION

Ambient and supplemental magnetic fields promote myogenesis via a TRPC1-mitochondrial axis: evidence of a magnetic mitohormetic mechanism

*(The FASEB Journal, 2019)*

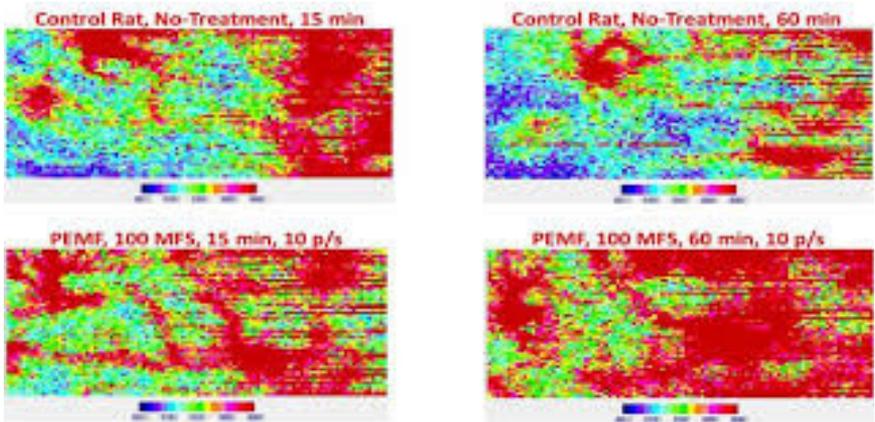
After understanding that biological cells behave like electrochemical cells (batteries) through chemical reactions and ion movements, it helps to understand exactly what cellular and sub-cellular reactions and ion movements take place under the influence of PEMF. While the referenced article discusses PEMF's mechanism of action on muscle cells, the components involved could translate to many other cells. For example, the TRPC1 protein involved in this study is a voltage-gated ion channel located on the plasma membrane of numerous human and animal cell types. PEMF helps position/orient TRPC1 so that it better facilitates the movement of calcium ( $\text{Ca}^{2+}$ ) ions into the cell. Inside the cell, calcium ions...

1. Get to the mitochondria, which in turn respire more
2. Aid in production of another protein (calcineurin) which supports the immune system, and
3. Stimulate epigenetic cascades that support production of mitochondria.

In essence, with (1) and (3) you have more mitochondria available and each is respiring more, thereby generating more ATP and energy for the cell to do its job. Given that TRPC1 and other voltage-gated calcium channels are in so many different cells, it makes sense that regardless of the cells in question, the central impact of PEMF is moving calcium ions and stimulating mitochondrial respiration and reproduction, leading to greater energy.

# AMPLIFIED PERFORMANCE

PEMF - Its Correlation to Enhanced Energy, Endurance, and Performance.



*(Old Dominion University, Frank Reidy Research Center for Bioelectrics, 2019)*

In 2019, ODU's Center for Bioelectrics studied the effects of Pulse Centers PEMF technology on rat subjects and subsequently measured the subjects' blood flow. The average increase in blood flow after each PEMF session was about 20% greater than the blood flow of the control subjects which were not given PEMF sessions. Additionally, blood flow after 60 minutes of PEMF treatment was significantly higher than blood flow after only 15 minutes of treatment. The researchers concluded that the results provide evidence that PEMFs improve blood flow, enhance oxygen consumption, and boost ATP production by facilitating electron transport. By doing so, they may also increase skeletal muscle cellular energy potential.

*"PEMFs increase heat-independent blood-flow to skeletal muscle after treatment. Increased blood flow, like that during exercise, enhances nutrient delivery and facilitates gas exchange in active or injured tissues."*

This study was performed on Pulse PEMF technology!

# ATHLETE TESTIMONIAL

Christian Gering, Ultramarathon Runner

"This machine—the PEMF—really helps me with recovery, helps with body awareness, and helps with the overall progression toward, you know, my sport. If it is a competitive edge, it's a really good one. I think I'm onto something and really I think there could be great benefits for athletes within the trail running world."

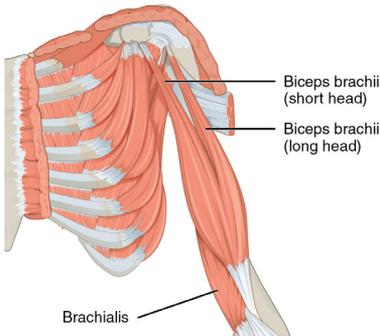
*"At the 50 mile mark, I knew I was well ahead of the next competitor and actually ended up beating that competitor by 45 minutes in my first debut 100K. The course record still holds—it's 9:48."*



## NATURAL RECOVERY

Effects of pulsed electromagnetic field therapy on delayed-onset muscle soreness in biceps brachii.

*(Physical Therapy in Sport, 2015)*



The official journal of the Association of Chartered Physiotherapists in Sports and Exercise Medicine published a study on PEMF's impact on delayed-onset muscle soreness (DOMS) in biceps brachii on 30 healthy human subjects. Their objective was to compare the effects of PEMF with placebo treatment on variables in elbow flexors following an exercise regimen that would induce muscle soreness.

*"Overall, the application of the PEMF was found to be effective in reducing the physiological deficits associated with DOMS [delayed onset muscle soreness], including improved recovery of perceived muscle soreness, increased median frequency (MDF), and enhanced electromechanical delay (EMD) during isometric contraction."*

# PULSE PROFESSIONAL TESTIMONIAL

## Susie Cahill, Dressage Rider

Melbourne Pulse Therapy - Victoria, Au

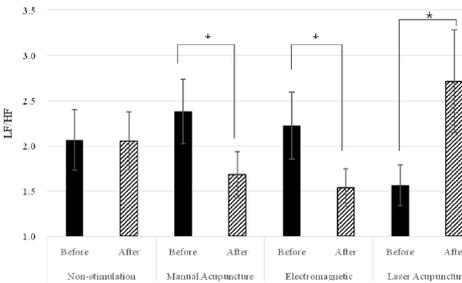
"After I found the Pulse, I didn't want to stop pulsing. The modality of PEMF, I was just so thrilled with it that I [rented] this mat, and I took it with me. I virtually had to sleep on it . . . and it got me through my two weeks of riding. My husband wasn't convinced that it was doing anything because it's a very intangible feeling . . . but when he first experienced the Pulse Centers machine, he said, 'This is the one you've gotta get.'"



## RELAXATION

Comparison of the Effects of Manual Acupuncture, Laser Acupuncture, and Electromagnetic Field Stimulation at Acupuncture Point BL15 on Heart Rate Variability.

*(Journal of Acupuncture and Meridian Studies, 2016)*



In this study, researchers focused on measuring heart rate variability (HRV), a key physiological metric for well-being. "An optimal level of HRV within an organism reflects healthy function and an inherent self-regulatory capacity, adaptability, and resilience." They found that

PEMF stimulation was identical to that of manual acupuncture in increasing HRV and activated the parasympathetic nervous system, typically responsible for rest and digestion.

*"In conclusion, we found that manual acupuncture and electromagnetic field stimulation [2 Hz and 460 gauss] at BL15 caused identical patterns for the activation of the parasympathetic nervous system."*

## ENHANCED ENERGY

Effects of a pulsed electromagnetic therapy on multiple sclerosis fatigue and quality of life: a double-blind, placebo controlled trial.

*(Alternative Therapies in Health and Medicine, 2003)*

In this study, scientists from Washington, Virginia, and New Jersey conducted experiments on effects of PEMF on subjects with multiple sclerosis. In this multi-site, double-blind, placebo-controlled trial, researchers noticed improvements in fatigue and overall quality of life in subjects who were placed on the active PEMF device. While the researchers were adamant that their study should be replicated and expanded upon, they noted the human body as being highly responsive to PEMF therapy.

*"Specifically, subjects experienced significantly less fatigue during the four weeks they wore the active [PEMF] device than they did while wearing the placebo device."*

# BENEFITS OF PEMF FOR HUMANS

As PEMF stimulates and exercises the cell, it is as if the cell “wakes up” and starts doing what it needs to do. It gets moving. It gets exercised. This is why PEMF is often referred to as “Cellular Exercise,” and this process has several implications for human wellness:

## Optimize Wellness - Non-Invasively<sup>[1]</sup>

PEMF generates energy at the cellular level without medically invasive procedures. This amplification of natural energy encourages the body to function more effectively for overall wellness.

## Enhance the Body's Natural Recovery Process<sup>[2]</sup>

Address underlying cellular dysfunction by stimulating and exercising the cells.

## Assist with Muscle Fatigue & Discomfort After Exercise<sup>[3]</sup>

Complement any training program.

## Support General Relaxation<sup>[4, 5]</sup>

PEMF is a soothing and restorative modality.

## Experience More ENERGY, Naturally<sup>[6, 7]</sup>

The body's holistic nature uses PEMF as a catalyst for full-body energy.

## Amplify Athletic Performance<sup>[7, 8]</sup>

Harness the power of natural energy to supplement training and performance goals.

<sup>[1,2,3,4,5,6,7,8]</sup>To locate the citations referenced here, visit [info.pulsecenters.com/research](http://info.pulsecenters.com/research)

## VETERINARY APPLICATIONS

### Veterinary applications of pulsed electromagnetic field therapy

*(Research in Veterinary Science, 2018)*

Currently, this is the most comprehensive secondary research study that exists on PEMF and its potential applications to animal wellness. This study explores the acceleration of PEMF in the veterinary industry in the last 10 years and why the modality is increasingly prescribed in the wellness regimens for animals of all sizes.

*"The data reviewed underscore the usefulness of PEMF treatment as a safe, non-invasive treatment modality that has the potential to become an important stand-alone or adjunctive treatment modality in veterinary care."*

## NATURAL HEALING

### Effects of Pulsed Electromagnetic Fields (PEMF) on Mouse Bone Marrow-Derived Macrophages

*(Old Dominion University, Frank Reidy Research Center for Bioelectrics, 2019)*

In 2019, ODU's Center for Bioelectrics studied the effects of Pulse Centers PEMF technology on mouse bone marrow-derived macrophages (specialized cells involved in the detection, phagocytosis and destruction of bacteria and other harmful organisms). A number of results were observed including the upregulation of anti-inflammatory cytokines (intercellular signalling molecules involved in

immunity, inflammation and hematopoiesis), downregulation of inflammatory cytokines, and enhancement of macrophages.

*"PEMF effects on macrophages\* can enhance the body's curative mechanisms to possibly clear infections and tissue damage, dissipate inflammation, and promote healing."*

This study was performed on Pulse PEMF technology!

# ANIMAL TESTIMONIAL

Brenda Tobin, Wellness Matters



"My client's 3 year old dog's symptoms were that she urinated frequently and had to wear diapers at night. She would vomit after drinking, had a dull coat, itched and had very low energy. After the first session of PEMF, the owner reported her dog had much more energy and she did not pee that night. After the third session, the owner was so impressed with the way her dog felt that she booked six more sessions. At the end of the six sessions, her dog was able to take walks and she even went swimming!

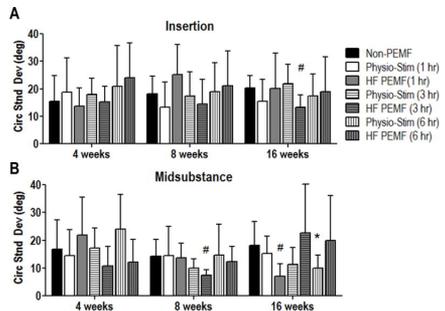
*The owners were so impressed with the positive results they had seen with PULSE PEMF that they bought a machine for their dog and their family!*

## JOINT & CARTILAGE FUNCTION

Effects of pulsed electromagnetic field therapy at different frequencies and durations on rotator cuff tendon-to-bone healing in a rat model.

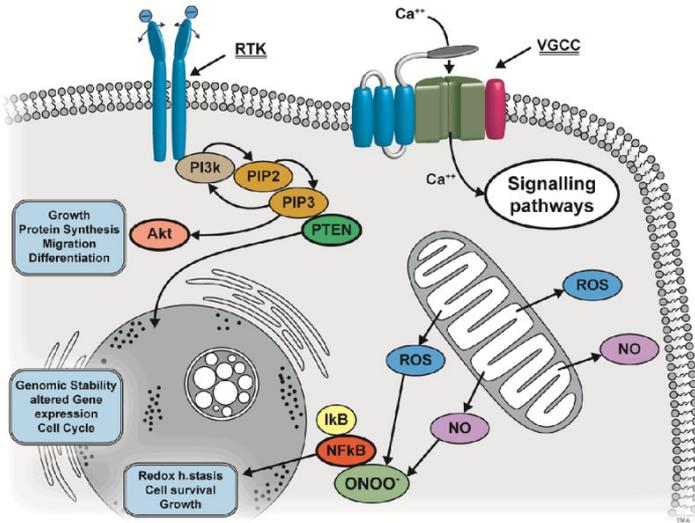
*(Journal of Shoulder and Elbow Surgery, 2018)*

In this study, 210 rat subjects underwent acute bilateral supraspinatus injury and repair followed by pulsed electromagnetic field stimulation for 1, 3, or 6 hours daily. Astoundingly, regardless of frequency or duration, improvements were seen in different mechanical properties on virtually all subjects that were given PEMF therapy.



*"Based on the results of this study, we speculate that PEMF treatment may increase tendon cell metabolism, which in turn increases both collagen production and matrix remodeling."*

# Coupling of pulsed electromagnetic fields (PEMF) therapy to molecular grounds of the cell



(American Journal of Translational Research, 2018)

This comprehensive scientific review served 4 goals: a) investigate whether there were truly positive clinical outcomes after PEMF therapy; b) screen experimental studies dealing with PEMF and musculoskeletal cells and tissue, especially regarding interleukins and TNF- $\alpha$  c) search for an electromagnetic intrinsic counterpart and trigger for PEMF in cells and tissues and d) look for causal molecular and cellular mechanisms of possible PEMF actions. Among these results:

*"[PEMF] is beneficial for both passive physical movement and for physical training performed by the patient."*

*"PEMF can lead to chondroprotective effects on joint cartilage in animal models."*

*"Proliferation, differentiation and synthesis of cartilage matrix proteins are enhanced by PEMF."*

# BENEFITS OF PEMF FOR ANIMALS

## Optimize Animal Wellness - Non-Invasively<sup>[1]</sup>

PEMF generates energy at the cellular level without invasive procedures. This amplification of natural energy encourages the body to function more effectively for overall wellness.

## Increase Range of Motion<sup>[7, 8]</sup>

Decreased inflammation and increased circulation may support the extension of muscle fibers.

## Generate Natural Cellular Energy<sup>[6, 7]</sup>

The holistic nature of an animal's body uses PEMF as a catalyst for full-body energy.

## Natural Support for Healthy Joint & Cartilage Function<sup>[9, 10]</sup>

Studies show that PEMF has the potential to improve calcium and collagen production.

## Assist with Muscle Fatigue & Discomfort After Exercise<sup>[3]</sup>

Reinforce any training program to help keep athletes fit and minimize stall rest.

## Support General Relaxation<sup>[4, 5]</sup>

PEMF is a relaxing and restorative modality that provides sedation-free, gentle pulsing.

## Complementary Modality<sup>[11]</sup>

Use in conjunction with other wellness modalities and complement veterinary-led treatment plans.

<sup>[1,3,4,5,6,7,8,9,10,11]</sup> To locate the citations referenced here, visit [info.pulseequine.com/research](http://info.pulseequine.com/research)



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