BENDING LINE
EQUINE BODYWORK

THE SCIENCE BEHIND PEMF

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 - for equine, canine and livestock.

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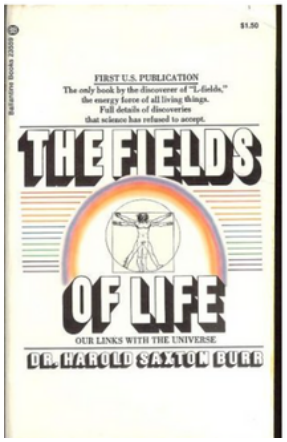
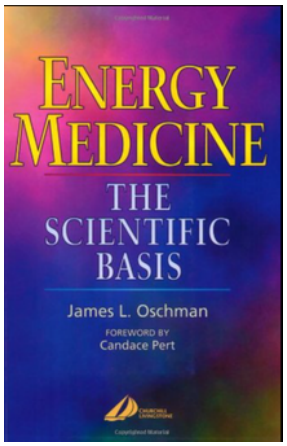
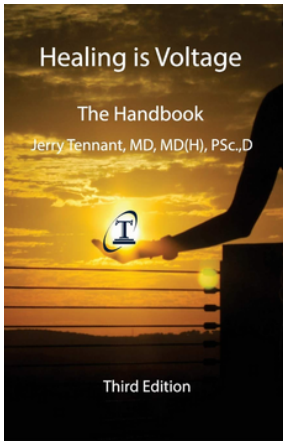
EARLY PUBLICATIONS



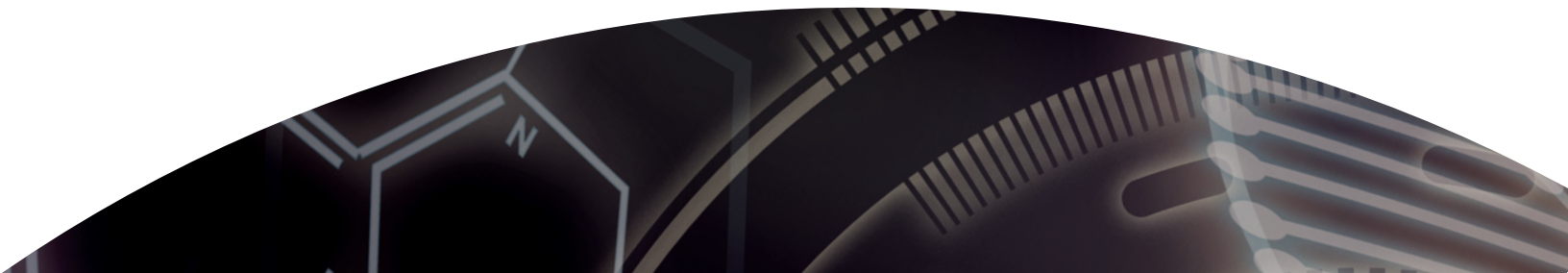
Harold Saxton Burr, Professor of Anatomy at Yale University, studied the predictive electromagnetic fields produced by the bodies of humans and animals and detailed his findings in publications such as The Fields of Life, The Electric Patterns of Life, and Blue print for Immortality.



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, a n d 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



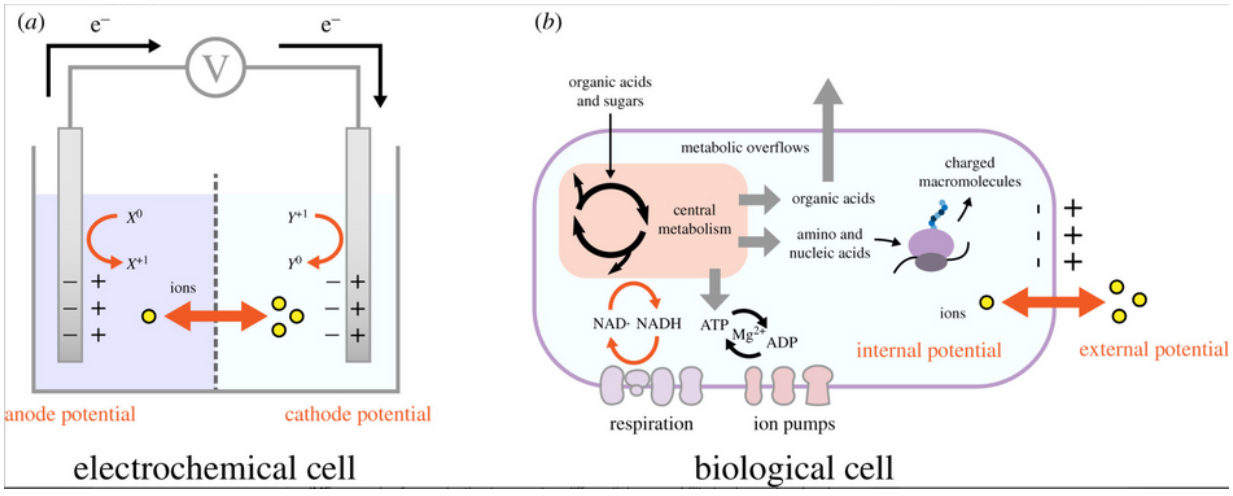
CELLS ARE LIKE BATTERIES

Journal of the Royal Society, 2020

Researchers from the University of War wick '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."

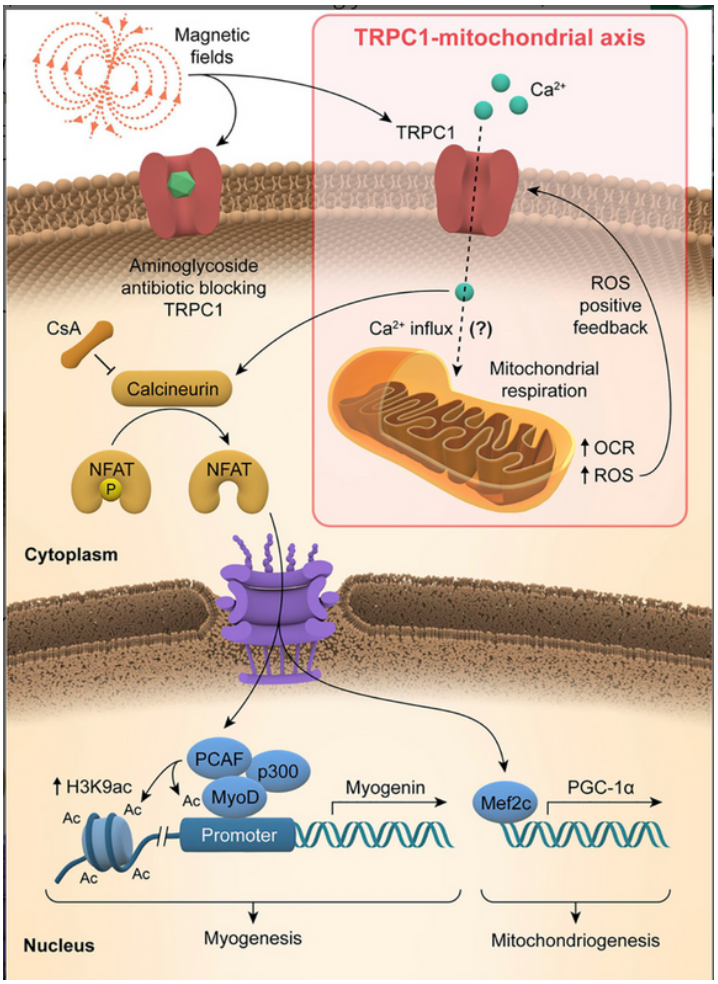
HOW PEMF WORKS:
THE MECHANISM IN ACTION

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 the 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 of 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 in the plasma membrane of numerous animal cells types. PEMF helps position / orient TRPC1 so that it better facilitates the movement of calcium (Ca2+) ions into the cell. Inside the cell, calcium ions:

1. Get to the mitochondria, which in turn respires more.
2. Aids in production of another protein (calcineurin) which supports the immune system
3. Stimulates epigenetic cascades that support production of mitochondria.



In essence, with (1) and (3) you 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 great energy.

BETTER PERFORMANCE

PEMF – Its correlation to enhanced energy, endurance and performance

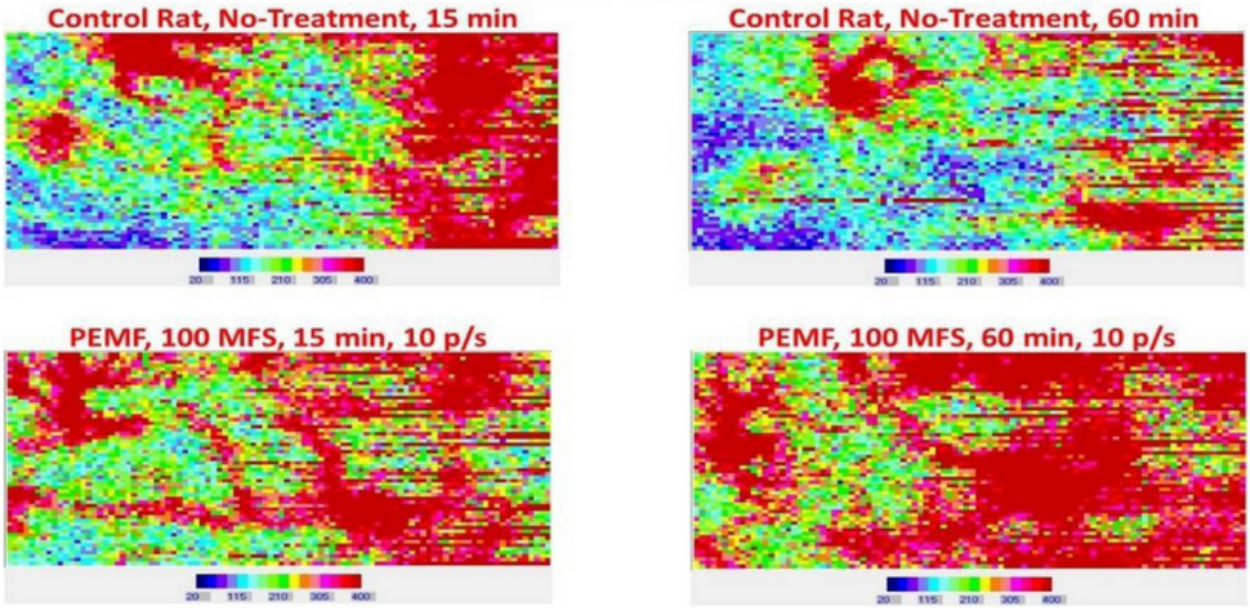
Old Dominion University, Frank Reidy Research Center for Bioelectrics, 2019

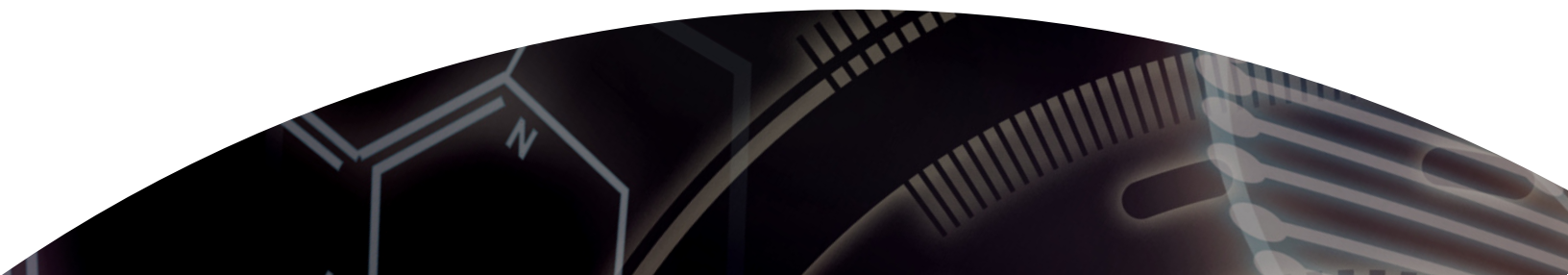
In 2019, ODU's Center for Bioelectrics studied the effects of PEMF technology on rat subjects and subsequently measured the subjects' blood flow. The average increase in blow flow after each PEMF session was about 20% greater than the blood flow of the control subjects which were not given PEMF sessions.

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 STP production by facilitating electron transports. By doing so, they may also increase skeletal muscle energy potential.

Disclosure: This study was performed using a similar technolgoy, Pulse PEMF.

Figure 1: PEMF Impact on Blood Flow as Measured by Laser Doppler



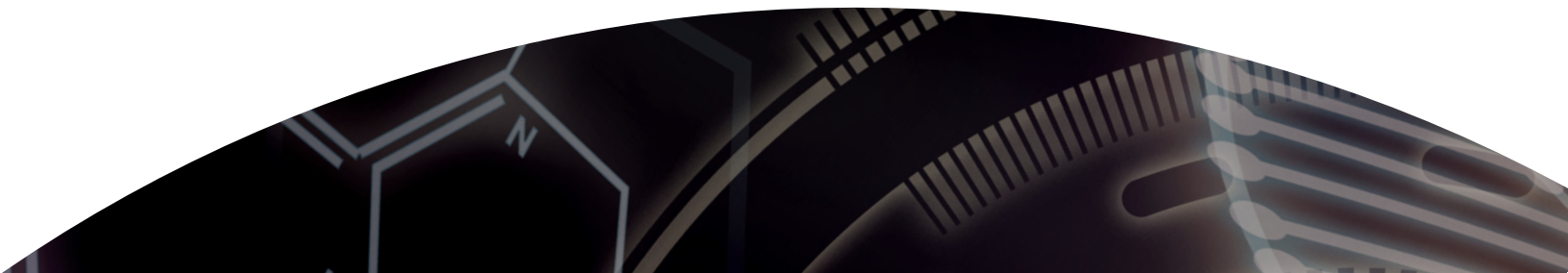


EFFECTS OF PULSED ELECTROMAGNETIC FIELDS (PEMF) IN MEDICINE

PrestigeLab, Prestige Company, Loro Ciuffenna (AR), Italy and BAC Srl, Incisa e Figline Valdarno (FI), Italy

The mechanisms of action of PEMF can be divided into three types, i.e. physical mechanisms, biophysical mechanisms, and purely biological mechanisms. While the physical mechanism of action is relatively simple, well known, and related to Faraday's law of induction, which states how "a time-varying (pulsating) electromagnetic field induces an electric field in a nearby conductor" [1], the mechanisms of action biophysical and biological are indeed very complex.

With every single pulse, the target tissue is hit by anelectromagnetic field. The main effect of this stimulation happens at the level of the plasma membrane of the cells, which undergoes a transient depolarization [7]. This event triggers very important secondary effects (a biophysical mechanism) through the transient opening of specific transmembrane ion channels, among which the voltage-dependent channels for the Calcium ion (Ca2+) stand out. Calcium is an important second cellular messenger, in fact, the entry of calcium into the cell, and its binding at the cytoplasmic level with Calmodulin (CaM), in a time equal to milliseconds from a single pulse, triggers a whole set of biochemical pathways to cascade in the cytoplasm. They include various enzymatic activations among which the release of Nitric Oxide (NO), in a time equal to seconds from a single pulse, through the activation of the cytoplasmic nitric oxide synthase (cNOS) [1,3,7,11,12].



EFFECTS OF PULSED ELECTROMAGNETIC FIELDS (PEMF) IN MEDICINE (CONT'D)

PrestigeLab, Prestige Company, Loro Ciuffenna (AR), Italy and BAC Srl, Incisa e Figline Valdarno (FI), Italy

Nitric oxide, considered a soluble hormone, in turn, activates a whole set of biochemical pathways, one of which leads to the production of Cyclic Guanosine Monophosphate (cGMP), another second messenger, in a time equal to seconds/ minutes from a single pulse. From this moment the tertiary effects of PEMF begin, of a purely biological type, which continue over a period ranging from a few hours to days and weeks starting from the first impulse and which include the transcriptional activation of various genes into the cell nucleus with the production of growth factors and other proteins and transmembrane receptors that will result in the orientation of the cells, regardless of the tissue they are part of, to regeneration and restore homeostasis [1,3,8,11-13] (Figure 1).