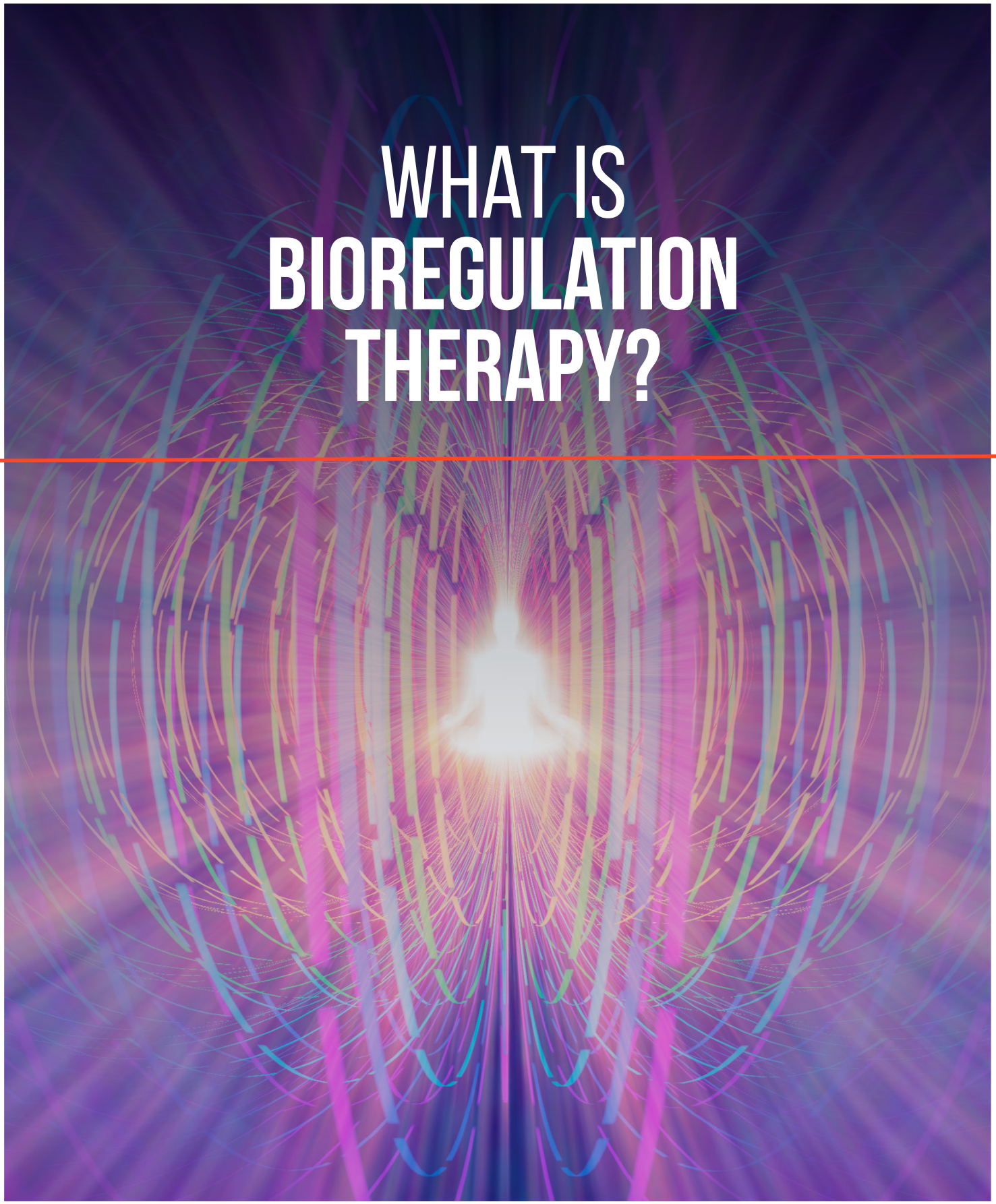
WHAT IS BIOREGULATION THERAPY?



NRBS NORTHEAST REGION BIOFEEDBACK SOCIETY

WHAT IS **BIOREGULATION THERAPY?**

Electromagnetic field (EMF) therapies are based upon the principle of treating the body with specially designed EMF signals that allow each cell to respond, through sympathetic resonance, in a manner that reinforces its own internal vibration [Lakhovsky, 1939]. EMF therapeutics now stands on a solid foundation of clinical, laboratory and theoretical evidence, with a number of EMF therapies having been shown to produce clinically relevant results [Shupak, 2003]. Among the most successful therapeutic modalities are those employing time--varying, i.e. pulsed EMF (PEMF) signals. The use of PEMF signals has several advantages over constant stimuli, including the ability to convey specific frequency and amplitude patterns into the body, the use of low duty cycles to target tissues without producing heating of tissues, and the induction of electric fields by transmitting a time-- varying magnetic component [Shupak, 2003]. The therapeutic use of PEMFs is now well-- established, with a growing number of double--blind placebo controlled studies and a growing number of modalities now approved by the US FDA and regulatory bodies worldwide for pathologies such as bone repair, pain, inflammation, and chronic repair [Pilla, 2006]. LENYO Bioregulation Therapy (BRT) devices employ PEMF signals uniquely designed to couple with the body's own vibrations, thus providing therapeutic benefits through an enhancement of the body's own natural healing abilities.

HISTORY OF **PULSED ELECTROMAGNETIC FIELD THERAPIES**

Based upon the well--established fact that the body's endogenous EMF vibrations play fundamental roles in normal development of the organism and vital physiological functions [Funk et al., 2006] including mitosis, meiosis [Zhao et al., 2012a] and gene expression [Zhao et al., 2012b], modern PEMF technology has origins in early 20th century advances in EMF therapeutics. At the turn of the 20th century, Nikola Tesla, the great electrical engineer and inventor, who was world famous at the time for his invention of alternating current dynamos and motors, promoted the concept that electromagnetic fields could be constructed specifically for therapeutic purposes [Tesla 1898]. Tesla advocated a therapeutic technique of passing high frequency EMFs through the human body using coils of up to three feet in diameter. In the 1920's, Georges Lakhovsky, a contemporary and collaborator with Tesla, designed and patented a Multi--Wave Oscillator (MWO) for therapeutics, based upon the idea of, in Lakhovsky's words, "covering all frequencies from 3 meters to the infra--red, so that every cell can find its natural frequency and vibrate in resonance" [Lakhovsky, 1934]. MWO devices employing a broad spectrum of EMF frequencies were used in French cancer clinics in the 1920's and 1930's. Lakhovsky developed methods for detecting ultraviolet (UV) emissions from plants and cells, leading him to state that, "Every living being emits radiations. From what we have just learned in connection with our physical studies of electromagnetic waves, it follows that emission of radiations necessarily implies an oscillatory phenomenon." [Lakhovsky, 1939]. These results were subsequently confirmed in human subjects by Albert Nodon, President of the Societe Astronomique of Bordeaux, who wrote, "It appears from the recorded facts that the vital cells of the human body emit electrons generated by an actual radio--activity whose intensity would seem to be much more considerable than that observed in insects and plants"[Nodon, 1927].

Concurrently, in 1923 the Ukranian histologist Alexander Gurwitsch made his famous discovery of ultraviolet (UV) light emission during cell division in onion roots [Beloussov, 1997]. He subsequently found that

these forms of UV light could stimulate cell division, and posited the existence of “mitogenic rays” governing basic processes of growth and repair. In recent years, the observations of Gurwitsch have been further developed in the biophoton research of Popp and Beloussov [Beloussov, 1995; Popp, 1992] and cell--cell communication via biophoton emission has been demonstrated in several studies [VanWijk, 2001]. Further work reported that coherent biophoton signalling could explain many regulatory functions (Popp and Chang, 1998), including cell--cell orientation detection (Albrecht--Buehler, 1992), biophoton--mediated secretion of regulatory neurotransmitters (Galantsev et al., (1993), respiratory activity in white blood cells [Shen et al., 2000], accelerated seed germination [Kuzin et al., 1995]. Thus, biophoton research demonstrates that coherent endogenous EMF information generated by living cells play basic functional roles in biological function, intercellular communication and cognition [Plankar et al., 2013].

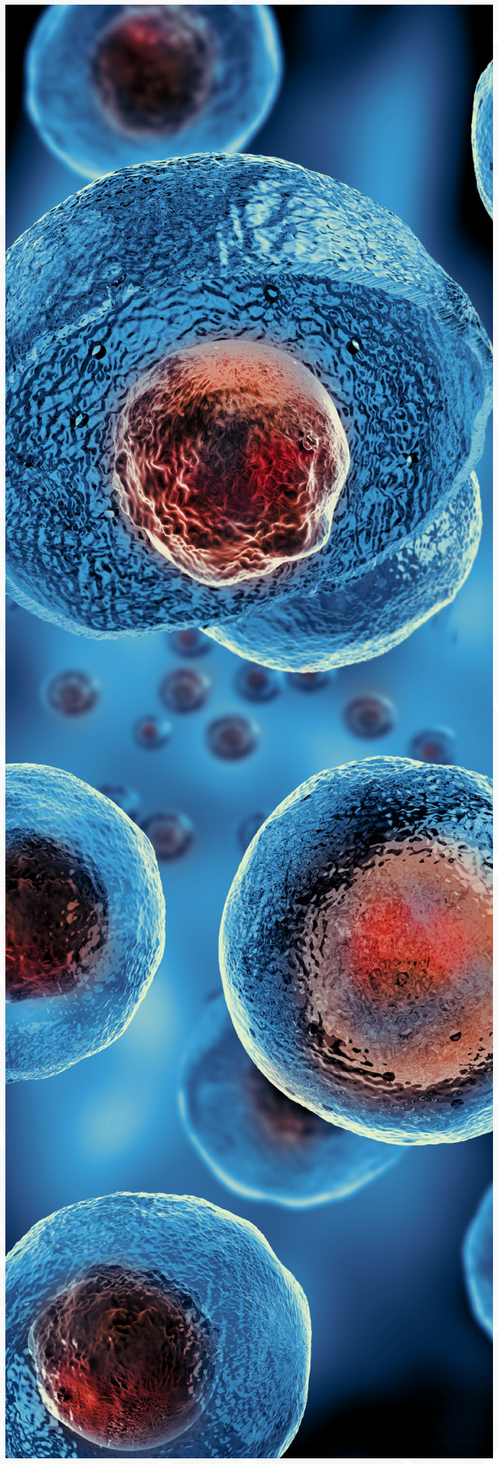
PRINCIPLES OF PEMF THERAPY

It has now been conclusively demonstrated that nonthermal PEMFs, which produce no heating of cells and tissues, have a wide variety of biological effects [Funk et al., 2009], demonstrating that nonthermal PEMFs act directly on cellular processes, rather than simply warming

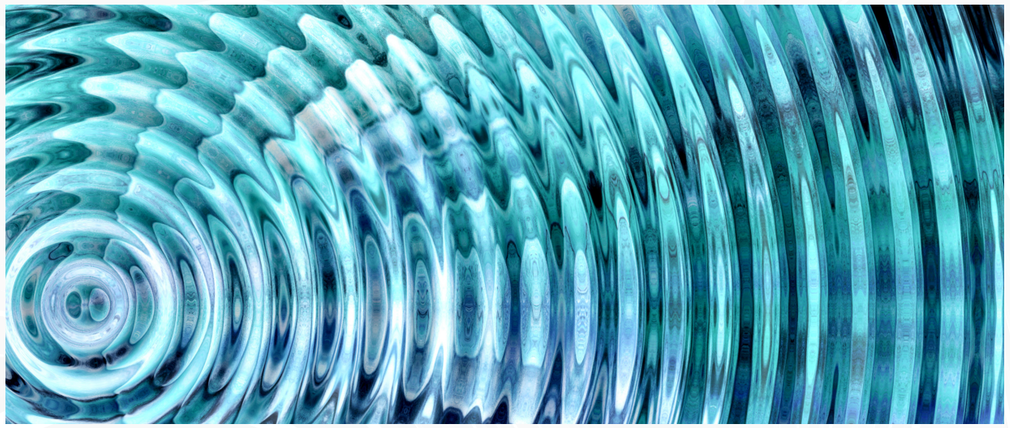
cells and tissues. Resonances for nonthermal PEMF signals have also been shown to occur, yielding enhanced or inhibited effects when the frequency and/or amplitude of the applied PEMF matches specific values for which cells or tissues have increased or decreased sensitivity. In recent years, it has been firmly established that EMF resonances exist in a wide range of biological systems, such as: brain waves and neural calcium efflux [Adey, 1980]; membrane transport [Liboff et al., 1987a]; 45Ca incorporation in human lymphocytes [Liboff et al., 1987b]; calcium flux in bone cells [Fitzsimmons et al., 1994]; liposome permeability [Ramundo--Orlando et al., 2000]; calcium signal transduction in the lymphocytes [Yost and Liburdy, 1992]; neurite outgrowth in PC--12 cells [Blackman et al., 1994a, 1994b, 1999; Trillo et al., 1996]; myosin phosphorylation [Markov et al., 1992]; calcium efflux though lipid vesicles [Koch et al., 2003]; glutamic acid currents in aqueous solution [Zhadin et al., 1998; Pazur, 2004; Comisso et al., 2006; Alberto, 2008a,b]; IGF--II expression for human osteosarcoma bone cells [Brain et al., 2003]; survival curve for mice infected with Ascites Ehrlich carcinoma [Novikov et al, 2009]; and cytokine release from osteoblasts in response to different intensities of PEMF stimulation [Li, 2007]. PEMF therapy is based upon such observations of resonances for nonthermal PEMF bioeffects, employing PEMF signals designed to couple sympathetically with these resonances in order to boost the natural vitality of cells and tissues [Lakhovsky, 1939]. LENYO Bioregulation Therapy PEMF resonance devices employ very low nonthermal magnetic field strengths (maximum 10 µT) to stimulate the body's own vibrations. The functional state of cells and tissues is improved, and thus the therapeutic benefits of EMF therapy occur through an enhancement of the body's own natural healing abilities.

Concurrently, in 1923 the Ukrainian biologist

A central principle of PEMF therapy is the enhancement of cell--cell communication. Intercellular communication is critical for normal embryogenesis and development, neural activity, gamete production, endocrine function, immune function, cardiovascular function, and the regulation of cell proliferation, apoptosis, and differentiation [Ruch, 2002]. Defects in cell--cell communication are associated with a wide variety of diseases, including, diabetes, autoimmune disorders, atherosclerosis, cancer, neuropathy, infertility, and other diseases [Trosko et al., 1998]. The activation of intercellular signaling mechanisms has been shown to be a key mechanism underlying the therapeutic effects of PEMFs [Seegers, 2001]. For example, a review of electric field therapies concluded that “a study of many in vitro and in vivo reports revealed that the beneficial effects can be attributed to the activation of membrane proteins, and specifically proteins involved in signal--transduction mechanisms” [Seegers, 2001].



Of particular interest to PEMF enhancement of cell--cell communication is the large body of research that has shown effects on signaling by the messenger molecule nitric oxide (NO). NO plays key roles in the promotion of microcirculation, reduction of inflammation, and initiation of a variety of growth and repair processes, and it has been conclusively demonstrated that NO signaling plays a central role in PEMF transduction, with reports of: enhancement of microvascular blood perfusion [Mayrovitz et al., 1992]; diabetic microcirculation and angiogenesis [Pan et al., 2012]; modulation of growth factor and cytokine release [Seegers et al., 2001; Brighton et al., 2001; Aaron et al., 2004; Li et al., 2007; Callaghan et al., 2008; Fitzsimmons et al., 2008; Rohde et al., 2009]; down--regulation of the inducible isoform of NOS, iNOS, in monocytes [Reale et al., 2006]; modulation nitric oxide synthase expression in the human keratinocyte cell line [Reale et al., 2010]; enhanced expression of neuronal nitric oxide synthase and phospholipase C--gamma1 in regenerating murine neuronal cells by pulsed electromagnetic field [Kim], reduction in pro--inflammatory cytokines in human keratinocytes [Vianale et al., 2008]; modulation of the sequential expression of iNOS, eNOS and cyclooxygenase--2 (COX--2) in human keratinocytes, [Patruno et al., 2010]; protective effect on dopaminergic neurons from several types of toxicity [Casper et al., 2006]; increase in cGMP in MN9D dopaminergic neurons [Casper et al., 2008]; increase in cGMP in endothelial cells [Tepper et al., 2004; Callaghan et al., 2008]; NO--mediated effects of pulsed electromagnetic field stimulation on osteoblast proliferation and differentiation [Diniz et al., 2002]; increase in articular chondrocyte proliferation though an NO--mediated pathway[Fitzsimmons et al., 2008]; increased rat osteoblast differentiation and maturation via activation of NO--cGMP--PKG pathway [Cheng et al., 2011]; increase in NO transient expression in MN9D cells [Pilla, 2012]. Thus, PEMF therapeutics has been shown to act via NO--signalling pathways, providing further supporting evidence that a key mechanism of PEMF therapies is the enhancement of cell--cell communication [Seegers, 2001].



LENYO BIOREGULATION THERAPY

LENYO BRT devices employ very low--amplitude PEMF signals, with a maximum magnetic field strength of 10 μT, (peak to peak) or approximately 20% of the Earth's magnetic field. The existence of bioeffects for PEMF signals of this strength has been firmly established, and the mechanisms by which extremely low frequency (ELF) μT--range magnetic fields can directly influence biological processes are now more clearly elucidated [Milyaev et al., 2006; Binhi et al., 2007; Machlup, 2007; Muehsam et al., 2009a,b]. In addition to a large literature on bioeffects due to geomagnetic--range field strength's [Volpe, 2003], a growing body of evidence has also shown that effects can also occur at much lower field strengths, on the order of nanoTesla, including effects on: development in chick embryos [Juutilainen et al., 1987; Berman et al., 1990]; in vitro breast cancer cell proliferation [Liburdy et al., 1993]; in vivo tumor growth [Novikov et al., 1996; Novikov, 2004; Novikov et al., 2005]; of planarian fission and regeneration [Novikov et al., 2008; Belova et al., 2007]; allergic encephalomyelitis in rats [Persinger et al., 1999]; gravitropism of plants [Belova et al., 2001]; MCF--7 breast cancer cell growth [Blackman et al., 2001]; and an Alzheimer's model in mice [Bobkova et al., 2005].

The specific PEMF signal patterning employed by LENYO BRT devices has been developed through 20--plus years of experience with thousands of patients. This has allowed for the development of PEMF treatments employing particular variations in frequency, pulse characteristics and treatment regime to treat specific pathologies. LENYO BRT devices are an evolutionary step forward from early--stage devices invented in the 1970's by Franz Morell and Erich Rasche. Subsequent development by Hans Brügemann of the Brügemann Institute resulted in the creation of devices which were shown in several studies to be effective [Henneck, 1997; Fedorowski et al., 2004; Nienhaus et al., 2006; Heredia--Rojas et al., 2011]. In addition to the evidence of PEMF resonances described above, sensitivity to specific PEMF signal patterning has been demonstrated in human brainwaves [Cook et al., 2009] and pain perception in animals [Thomas et al., 1997], further supporting the use of patterned PEMF signals for specific pathologies.

LENYO BRT devices operate in two ways: 1) Endogenous Field BRT devices make use, in real time, of the body's own EMF output by creating an extremely low current resonant connection between the patient and the device. Through specialized signal processing of the patient's own EMF signature, endogenous field BRT modifies this signature to produce an EMF treatment tailored to the patient; 2) Exogenous Field BRT devices employ a low intensity, broad frequency spectrum of harmonic energies so that, through the principle of resonance, each cell would "pick out exactly the proper frequency needed to reinforce its own internal vibration" [Lakhovsky, 1939]. Everyone is different, and cells and tissues exhibit varying PEMF sensitivity/activity depending upon their state of growth, repair or injury [Muehsam et al., 1999]. To account for this, LENYO

BRT endogenous field devices make use of each individual's unique EMF signature to create a therapy that is unique for that person. Exogenous field BRT uses broad spectrum, pulsed electromagnetic field (PEMF) signals to allow the body to choose those frequencies to which it is most responsive [Lakhovsky, 1939], coupled with signal patterning designed to evoke specific therapeutic responses.

LENYO BRT devices employ PEMF technology constructed to couple with the specific naturally--occurring resonant responses of the body, enhancing the body's own natural healing abilities using ambient--range magnetic field strengths. A large and growing body of evidence exists describing clinical effects, nonthermal EMF bioeffects, and the enhancement of intercellular communication by PEMF treatment. With more than 20 years of clinical development, LENYO Bioregulation Therapy is based upon this body of proven scientific research demonstrating the therapeutic efficacy and basic biological processes underlying PEMF therapies.

REFERENCES

Aaron RK, Boyan BD, Ciombor DMcK, Schwartz Z, Simon BJ. 2004. Stimulation of Growth Factor Synthesis by Electric and Electromagnetic Fields. Clin Orthop 419:30–37.

Adey WR. 1980. Frequency and power windowing in tissue interactions with weak electromagnetic fields, Proc. IEEE. 68:119–125.

Alberto D, Busso L, Crotti G, Gandini M, Garfagnini R, Giudici P, Gnesi I, Manta F, Piragino G. 2008. Effects of static and low--frequency alternating magnetic fields on the ionic electrolytic currents of glutamic acid aqueous solutions. Electromagn Biol Med. 27(1):25-- 39.

Alberto D, Busso L, Garfagnini R, Giudici P, Gnesi I, Manta F, Piragino G, Callegaro L, Crotti
G. 2008. Effects of extremely low--frequency magnetic fields on L--glutamic acid aqueous solutions at 20, 40, and 60 microT static magnetic fields. Electromagn Biol Med. 27(3):241-- 53.

Albrecht--Buehler G. 1992. Rudimentary form of cellular vision. Proceedings of the National Academy of Sciences USA, (89):8288–8292.

Beloussov LV, Opitz JM, Gilbert SF. 1997. Life of Alexander G. Gurwitsch and his relevant contribution to the theory of morphogenetic fields. Int J Dev Biol. 41(6):771--7.

Beloussov LV, Popp FA. 1995. Biophotonics -- The Non--Equilibrial and Coherent Systems in Biology, Biophysics and Biotechnology. BioInform Services, Moscow (in English).
International Institute of Biophysics Station Hombroich Vockrather Swasse, Neuss, Germany.

Belova NA, Ermakova ON, Ermakov AM, Rojdestvenskaya ZYE, Lednev VV. 2007. The bioeffects of extremely weak power--frequency alternating magnetic fields.
Environmentalist 27:411 – 416.

Belova NA, Lednev VV. 2001. Effects of extremely weak alternating magnetic fields on the gravitropism of plants. Biofizika 46:122–125.

Berman E, Chacon L, House D, Koch BA, Koch WE, Leal J, Løvtrup S, Mantiply E, Martin AH, Martucci GI, Mild KH, Monaham JC, Sandstrom M, Shamsaifar K, Tell R,

Binhi VN Rubin AB. 2007. Magnetobiology: The kT paradox and possible solutions. Electromagnetic Biology and Medicine. 26:45--62.

Blackman CF, Benane SG, House DE. 2001. The influence of 1.2 mT, 60 Hz magnetic field on melatonin-- and tamoxifen-- induced inhibition of MCF--7 cell growth. Bioelectromag-- netics 22:122–128.

Blackman CF, Blanchard JP, Benane SG, House DE. 1994. Empirical test of an ion parametric resonance model for magnetic field interactions with PC--12 cells. Bioelectromagnetics 15:239–260.

Blackman CF, Blanchard JP, Benane SG, House DE. 1999. Experimental determination of hydrogen bandwidth for the ion parametric resonance model. Bioelectromagnetics 20:5– 12.

Blanchard JP, Blackman CF. 1994. Clarification and application of an ion parametric resonance model for magnetic field interactions with biological systems.
Bioelectromagnetics. 15:217–238.

Bobkova NV, Novikov VV, Medvinskaya NI, Aleksandrova IYu, Fesenko EE. 2005. Reduction in the b--amyloid level in the brain under the action of weak combined magnetic fields in a model of sporadic Alzheimer's disease. Biophysics 50:S2 – S7.

Brain JD, Kavet R, McCormick DL, Poole C, Silverman LB, Smith TJ, Valberg PA, Van Etten RA, Weaver JC. 2003. Childhood leukemia: electric and magnetic fields as possible risk factors. Environ Health Perspect. 111(7):962--70.

Brighton CT, Wang W, Seldes R, Zhang G, Pollack SR. 2001. Signal Transduction in Electrically Stimulated Bone Cells. J Bone Joint Surg 83A:1514-- 1523.

Callaghan MJ, Chang EI, Seiser N, Aarabi S, Ghali S, Kinnucan ER, Simon BJ, Gurtner GC. 2008. Pulsed Electromagnetic Fields Accelerate Normal and Diabetic Wound Healing by Increasing Endogenous FGF--2 Release. Plastic and Reconstructive Surgery. 121:130--141.

Casper D, Lekhraj R, Pidel A, Pilla AA. 2008. Transient induction of nitric oxide by PEMF in the dopaminergic MN9D neuronal cell line. Proceedings of the 30th Annual Meeting of the Bioelectromagnetics Society, San Diego, CA; June 8--12, p 155.

Casper D, Taub E, Alammar L, Pidel A, Pilla AA. 2006. Pulsed electromagnetic fields have neuroprotective effects on cultured dopaminergic neurons. Experimental Neurology 198: 558--597.

Cheng G, Zhai Y, Chen K, Zhou J, Han G, Zhu R, Ming L, Song P, Wang J. 2011. Sinusoidal electromagnetic field stimulates rat osteoblast differentiation and maturation via activation of NO--cGMP--PKG pathway. Nitric Oxide. 25:316--325.

Comisso N, Del Giudice E, De Ninno A, Fleischmann M, Giuliani L, Mengoli G, Merlo F, Talpo
G. 2006. Dynamics of the ion cyclotron resonance effect on amino acids adsorbed at the interfaces. Bioelectromagnetics. 27(1):16--25.

Cook CM, Saucier DM, Thomas AW, Prato FS. 2009. Changes in human EEG alpha activity following exposure to two different pulsed magnetic field sequences. Bioelectromagnetics (1)9--20.

Diniz P, Soejima K, Ito G. 2002. Nitric oxide mediates the effects of pulsed electromagnetic field stimulation on the osteoblast proliferation and differentiation. Nitric Oxide. 7:18--23.

Fedorowski A, Steciwko A, Rabczynski J. 2004. Low--frequency electromagnetic stimulation may lead to regression of Morris hepatoma in buffalo rats. J Altern Complement Med.
10(2):251--60.

Fitzsimmons RJ, Gordon SL, Kronberg J, Ganey T, Pilla AA. 2008. A pulsing electric field (PEF) increases human chondrocyte proliferation through a transduction pathway involving nitric oxide signaling. J Orthop Res 26:854--9.

Fitzsimmons RJ, Ryaby JT, Magee FP, Baylink DJ. 1994. Combined magnetic fields increased net calcium flux in bone cells. Calcif Tissue Int. 55(5):376--80.

Funk RH, Monsees TK. 2006. Effects of electromagnetic fields on cells: physiological and therapeutical approaches and molecular mechanisms of interaction. A review. Cells Tissues Organs. 2006;182(2):59--78.

Funk RH, Monsees T, Ozkucur N. 2009. Electromagnetic effects -- From cell biology to medicine. Prog Histochem Cytochem. 43(4):177--264.

Galantsev VP, Koralenko SG, Moltchanov, AA, Prutskov VI. 1993. Lipid peroxidation, low-- level chemiluminescence and regulation of secretion in the mammary gland. Experientia. 49:870–875.

Heredia--Rojas JA, Torres--Flores AC, Rodríguez--De la Fuente AO, Mata--Cárdenas BD, Rodríguez--Flores LE, Barrón--González MP, Torres--Pantoja AC, Alcocer--González JM. 2011. Entamoeba histolytica and Trichomonas vaginalis: trophozoite growth inhibition by metronidazole electro--transferred water. Exp Parasitol. 127(1):80--83.

Hennecke J. 1994. Energetic Allergy Therapy – Possibilities and Experiences with Bicom Bioresonance Therapy. Medical Journal of Naturopathy 35:427--432;

Juutilainen J, Laara E, Saali K. 1987. Relationship between strength and abnormal development in chick embryos exposed to 50 Hz magnetic field. Int J Radiat Biol Relative Studies Phys Chem Med 52:787–793.

Kim SS, Shin HJ, Eom DW, Huh JR, Woo Y, Kim H, Ryu SH, Suh PG, Kim MJ, Kim JY, Koo TW, Cho YH, Chung SM. 2002. Enhanced expression of neuronal nitric oxide synthase and phospholipase C--gamma1 in regenerating murine neuronal cells by pulsed electromagnetic field. Exp Mol Med 34:53--9.

Koch CLM, Sommarin M, Persson BRR, Salford LG, Eberhardt JL. 2003. Interaction between weak low--frequency magnetic fields and cell membranes. Bioelectromagnetics 24:395 – 402.

Kuzin AM, Surbenova GN. 1995. Secondary biogenic irradiation of plant structures after gamma--irradiation at low dose. In Beloussov, L. V., & Popp, F. A. (Eds.), Biophotonics.
Moscow: Bioinform Services. pp. 257–265.

Lakhovsky G. 1934. US Patent US1962565 A. Apparatus with Circuits Oscillating. Lakhovsky G. 1939. Secret of Life. ISBN 13: 9780766141971.
Li JK, Lin JC, Liu HC, Chang WH. 2007. Cytokine release from osteoblasts in response to different intensities of pulsed electromagnetic field stimulation. Electromagn Biol Med 26:153--65.

Liboff AR, Rozek RJ, Sherman ML, McLeod BR, Smith SD. 1987. Nifedipine is an antagonist to cyclotron resonance enhancement of 45Ca incorporation in human lymphocytes. Cell Calcium 8:413–427.

Liboff AR, Smith SD, McLeod BR. 1987. Experimental evidence for ion cyclotron resonance mediation of membrane transport. In: Blank M, Findl E, editors. Mechanistic approaches to interactions of electric and electromagnetic fields with living systems. New York: Plenum Press. pp. 281–296.

Liburdy RP, Sloma TR, Sokolic R, Yaswen P. 1993. EMF magnetic fields, breast cancer, and melatonin: 60 Hz field block melatonin's oncostatic action of ERþ breast cancer cell proliferation. J Pineal Res 14:89–97.

Machlup S. 2007. Ion parametric resonance: resolving the signal--to--noise--ratio paradox. Electromagn Biol Med. 26(3):251--6.

Markov MS, Ryaby JT, Kaufman JJ, Pilla AA. 1992. Extremely weak AC and DC magnetic fields significantly affect myosin phosphorylation. In: Allen MJ, Cleary SF, Sowers AE, Shillady DD (Eds.) Charge and Field effects in biosystems 3, Boston: Birkhauser, pp. 225-- 230.

Mayrovitz HN, Larsen PB. 1992. Effects of Pulsed Magnetic Fields on Skin Microvascular Blood Perfusion. Wounds: A Compendium of Clinical Research and Practice 4:192--202.

Milyaev VA, Binhi VN. 2006. On the physical nature of magnetobiological effects. Quantum Electron. 36:691–701.

Muehsam DJ, Pilla AA. 1999. The sensitivity of cells and tissues to exogenous fields: effects of target system initial state. Bioelectrochem Bioenerg. 1999 Feb;48(1):35--42.

Muehsam DJ, Pilla AA. 2009a. A Lorentz Model for Weak Magnetic Field Bioeffects: Part I -- Thermal Noise Is an Essential Component of AC/DC Effects on Bound Ion Trajectory.
Bioelectromagnetics. Bioelectromagnetics. 30(6): 462--475.

Muehsam DJ, Pilla AA. 2009b. A Lorentz Model for Weak Magnetic Field Bioeffects: Part II – Secondary Transduction Mechanisms and Measures of Reactivity. Bioelectromagnetics.
30(6):476--88.

Nienhaus J, Galle M. 2006. Placebo--controlled study of the effects of a standardized MORA bioresonance therapy on functional gastrointestinal complaints. Forsch Komplementmed. 13(1):28--34. [Article in German]

Nodon A. 1927. Les nouvelles radiation; ultra--penetrantes et la cellule vivante. Revue Scientifique. p. 609. In French.

Novikov VV, Novikov GV, Fesenko EE. 2009. Effect of weak combined static and extremely low--frequency alternating magnetic fields on tumor growth in mice inoculated with the Ehrlich Ascites carcinoma. Bioelectromagnetics 30:343--51.

Novikov VV, Novikova NI, Kachan AK. 1996. Cooperative effects by the action of weak magnetic fields on the tumor growth in vivo. Biofizika 41:934–938.

Novikov VV, Ponomarev VO, Fesenko EE. 2005. Analysis of the biological activity of two-- frequency magnetic signal and single--frequency variable components during exposure to weak and extremely weak combined constant and low-- frequency variable magnetic fields on the growth of grafted tumors in mice. Biophysics 50:S110–S115.

Novikov VV, Sheiman IM, Fesenko EE. 2008. Effect of weak static and low--frequency alternating magnetic fields on the fission and regeneration of the planarian Dugesia (Girardia) tigrina. Bioelectromagnetics 29:387–393.

Novikov VV. 2004. Antitumor effects of weak and ultraweak magnetic field. Biophysics 49:S43–S47.

Pan Y, Dong Y, Hou W, Ji Z, Zhi K, Yin Z, Wen H, Chen Y. 2012. Effects of PEMF on microcirculation and angiogenesis in a model of acute hindlimb ischemia in diabetic rats. Bioelectromagnetics. 34(3):180--8.

Patruno A, Amerio P, Pesce M, Vianale G, Di Luzio S, Tulli A, Franceschelli S, Grilli A, Muraro R, Reale M. 2010. Extremely low frequency electromagnetic fields modulate expression of inducible nitric oxide synthase, endothelial nitric oxide synthase and cyclooxygenase--2 in the human keratinocyte cell line HaCat: potential therapeutic effects in wound healing. Br J Dermatol. 162:258--66.

Pazur A. 2004. Characterisation of weak magnetic field effects in an aqueous glutamic acid solution by nonlinear dielectric spectroscopy and voltammetry. Biomagn Res Technol.
2004 Nov 30;2(1):8.

Persinger MA, Cook LL, Koren SA. 1999. Suppression of experimental allergic encephalomyelitis in rats exposed nocturnally to magnetic fields. Int J Neurosci 100:107– 116.

Pilla AA. 2006. Mechanisms and therapeutic applications of time varying and static magnetic fields, in: Barnes F, Greenebaum B editors. Biological and Medical Aspects of Electromagnetic Fields. Boca Raton, CRC Press. pp. 351–411.

Pilla AA. 2012. Electromagnetic fields instantaneously modulate nitric oxide signaling in challenged biological systems. Biochem Biophys Res Commun. 426(3):330--3.

Plankar M, Brežan S, Jerman I. 2013. The principle of coherence in multi--level brain information processing. Prog Biophys Mol Biol. 111(1):8--29.

Popp F A, Chang JJ. 1998. The physical background and the informational character of biophoton emission. In Chang, J. J., Fish, J., & Popp, F. A. (Eds.), Dordrecht, The Netherlands: Kluwer. Biophotons (pp. 238–250).

Popp FA, Li KH, Gu Q. (eds). 1992. Recent advances In biophoton research and its applications. World Scientific. Singapore, New York., london. Hong Kong.

Ramundo--Orlando A, Morbiducci U, Mossa G, D'Inzeo G. 2000a. Effect of low frequency, low amplitude magnetic fields on the permeability of cationic liposomes entrapping carbonic anhydrase I. Evidence for charged lipid involvement. Bioelectromagnetics 21:491–498.

Reale M, De Lutiis MA, Patruno A, et al. 2006. Modulation of MCP--1 and iNOS by 50--Hz sinusoidal electromagnetic field. Nitric Oxide 15:50--7.

Reale M. 2010. Extremely low frequency electromagnetic fields modulate expression of inducible nitric oxide synthase, endothelial nitric oxide synthase and cyclooxygenase--2 in the human keratinocyte cell line HaCat: potential therapeutic effects in wound healing. Br J Dermatol. 162:258--66.

Rohde C, Chiang A, Adipoju O, Casper D, Pilla AA. 2009. Effects of Pulsed Electromagnetic Fields on IL--1□ and Post Operative Pain: A Double--Blind, Placebo--Controlled Pilot Study in Breast Reduction Patients. Plast Reconstr Surg. 125(6):1620--9.

Ruch RJ. 2002. Intercellular communication, homeostasis, and toxicology. Toxicol Sci. 68(2):265--6.

Seegers JC, Engelbrecht CA, van Papendorp DH. 2001. Activation of signal--transduction mechanisms may underlie the therapeutic effects of an applied electric field. Med Hypotheses. 57(2):224--30.

Shen X, Bei L, Hu TH, Aryal B. 2000. The possible role played by biophotons in the long-- range interaction between neutrophil leukocytes. In Beloussov, L., Popp, F. A., Voeikov, V., & VanWijk, R. (Eds.), Biophotonics and Coherent System. Moscow: Moscow University Press. pp. 336–346.

Shupak NM. 2003. Therapeutic Uses of Pulsed Magnetic--Field Exposure: A Review. Radio Science Bulletin. 3072:9--32.

Shuvalova LA, Ostrovskaia MV, Sosunov EA, Lednev VV. 1991. Influence of a weak magnetic field under conditions of parametric resonance on the rate of calmodulin--dependent phosphorylation of myosin in solution. Proc Natl Acad Sci USSR (Biophysics) 317: 227–230 (in Russian).

Taniguchi N, Kanai S, Kawamoto M, Endo H, Higashino H (2004) Study on application of static magnetic field for adjuvant arthritis rats. Evid Based Complement Alternat Med 1: 187–191.

Tepper OM, Callaghan MJ, Chang EI, Galiano RD, Bhatt KA, Baharestani S, Gan J, Simon B, Hopper RA, Levine JP, Gurtner GC. 2004. Electromagnetic fields increase in vitro and in vivo angiogenesis through endothelial release of FGF--2. FASEB J 18:1231--1233.

Tesla N. 1898. High frequency oscillators for electro--therapeutic and other purposes. The Electrical Engineer. 25(550):477.

Thomas, A. W., Kavaliers, M., Prato, F. S. & Ossenkopp, K. P. 1997 Antinociceptive effects of a pulsed magnetic field in the land snail, Cepaea nemoralis. Neurosci. Lett. 222: 107–110.

Trillo MA, Ubeda A, Blanchard JP, House DE, Blackman CF. 1996. Magnetic fields at resonant conditions for the hydrogen ion affect neurite outgrowth in PC--12 cells: A test of the ion parametric resonance model. Bioelectromagnetics 17:10– 20.

Trosko, J. E., Chang, C. C., Upham, B., and Wilson, M. 1998. Epigenetic toxicology as toxicant-- induced changes in intracellular signaling leading to altered gap junctional intercellular communication. Toxicol. Lett. 102–103:71–78.

Vanwijk R. 2001. Bio--photons and Bio--communication. Journal of Scientific Exploration. 15(2): 183–197.

Vianale G, Reale M, Amerio P, Stefanachi M, Di Luzio S, Muraro R. 2008. Extremely low frequency electromagnetic field enhances human keratinocyte cell growth and decreases proinflammatory chemokine production. Br J Dermatol 158:1189--96.

Volpe P. 2003. Interactions of zero--frequency and oscillating magnetic fields with biostructures and biosystems. Photochem Photobiol Sci. 2(6):637--48.

Yost MG, Liburdy RP. 1992. Time--varying and static magnetic fields act in combination to alter calcium signal transduction in the lymphocyte. FEBS 296:117–122.

Zhadin MN, Novikov VV, Barnes FS, Pergola NF. 1998. Combined action of static and alternating magnetic fields on ionic current in aqueous glutamic acid solution.
Bioelectromagnetics. 1998;19(1):41--5.

Zhao Y, Zhan Q. 2012a. Electric fields generated by synchronized oscillations of microtubules, centrosomes and chromosomes regulate the dynamics of mitosis and meiosis. Theor Biol Med Model. 9:26.

Zhao Y, Zhan Q. 2012b. Electric oscillation and coupling of chromatin regulate chromosome packaging and transcription in eukaryotic cells. Theor Biol Med Model. 2012 Jul 3;9:27.

NRBS NORTHEAST REGION BIOFEEDBACK SOCIETY