

# DECADES OF WORLDWIDE CLINICAL TRIALS DEMONSTRATE THE HEALING AND REGENERATIVE PROPERTIES OF PULSED ELECTROMAGNETIC FIELD (“PEMF”) THERAPY

Page 2	ADP - ATP	Incontinence
	Arthritis	Lymphocytes
	Autism	Migraine
Page 3	Bacterial Infection Control	Page 9 Multiple Sclerosis
	Birth Trauma	Nerve Repair
	Bone Healing	Page 10 Neuropathy
Page 4	Cancer	Nitric Oxide
Page 5	Carpal Tunnel Syndrome	Obesity
	Cartilage Healing	Osteoporosis
	Cell Regeneration	Pain
Page 6	Circulation	Page 12 Parkinson’s Disease
	Depression	Perthes’ Disease
	Diabetes	Prostate
Page 7	Dental	Surgical Recovery
	Edema	Page 13 Range of Motion
	Endometritis	Tendonitis
	Erectile Dysfunction	Page 14 Tennis Elbow
	Fibromyalgia	Ulcers
	Hematoma	Page 15 Vision
Page 8	Hypertension	Wound Healing
	Inflammation	Page 16 The Science of PEMF

## ADP – ATP

- 2009  
Italy [New Insights and Possible Therapeutic Implications of Adenosine Analogs and Pulsed Electromagnetic Fields \(PEMFs\) in Osteoarticular Pathologies.](#)  
Masieri, Federica Francesca. Università degli studi di Ferrara.

## Arthritis

- 1992  
Italy [Therapeutic effects of pulsed magnetic fields on joint diseases.](#)  
Riva Sanseverino E, Vannini A, Castellacci P. *Panminerva Med.* 1992 Oct-Dec;34(4):187-96. PMID: 1293548.
- 1993  
USA [A double-blind trial of the clinical effects of electro-magnetic fields in osteoarthritis.](#)  
Trock DH, Bollet AJ, Dyer RH Jr, Fielding LP, Miner WK, Markoll R., Department of Medicine (Rheumatology), Danbury Hospital, CT.
- 1994  
USA [The effect of Pulsed Electro-Magnetic Fields in the treatment of osteoarthritis of the knee and cervical spine. Report of randomized, double blind, placebo controlled trials.](#)  
Trock DH, Bollet AJ, Markoll R. Department of Medicine, Danbury Hospital, CT.
- 1998  
India [A study of the effects of Pulsed Electro-Magnetic Field Therapy with respect to serological grouping in rheumatoid arthritis.](#)  
Ganguly KS, Sarkar AK, Datta AK, Rakshit A. National Institute for the Orthopaedically Handicapped (NIOH), Calcutta.
- 2000  
Japan [A case of congenital pseudarthrosis of the tibia treated with Pulsing Electro-Magnetic Fields. 17-year follow-up.](#)  
Ito H, Shirai Y, Gembun Y., Department of Orthopaedic Surgery, Nippon Medical School, Tokyo.
- 2001  
UK [Magnetic pulse treatment for knee osteoarthritis: a randomised, doubleblind, placebo-controlled study.](#)  
Pipitone N, Scott DL. Rheumatology Department, King's College Hospital (Dulwich), London.
- 2001  
Canada [Electro-Magnetic fields for the treatment of osteoarthritis.](#)  
Hulme J, Robinson V, DeBie R, Wells G, Judd M, Tugwell P., Cochrane Collaborating Center, Center for Global Health, Institute of Population Health - University of Ottawa, 1 Stewart Street, Ottawa, Ontario.
- 2002  
Austria [Pulsed magnetic field therapy for osteoarthritis of the knee--a double-blind sham-controlled trial.](#)  
Nicolakis P, Kollmitzer J, Crevenna R, Bittner C, Erdogmus CB, Nicolakis J., Department of Physical Medicine and Rehabilitation, AKH Wien, University of Vienna, Vienna.
- 2003  
USA [Modification of osteoarthritis by Pulsed Electro-Magnetic Field--a morphological study.](#)  
Ciombor DM, Aaron RK, Wang S, Simon B. Department of Orthopaedics, Brown Medical School, Providence, RI.
- 2005  
Denmark [Treatment of knee osteoarthritis with pulsed electromagnetic fields: a randomized, double-blind, placebo-controlled study.](#)  
Thamsborg G, Florescu A, Oturai P, Fallentin E, et al. *Osteoarthritis and Cartilage* 13(7):575-81.
- 2015  
Germany [Effects of PEMF on patients with osteoarthritis: Results of a prospective, placebo-controlled, double-blind study.](#)  
Heinz Wuschech, Ulrike von Hehn, Eberhard Mikus, Richard H. Funk <https://doi.org/10.1002/bem.21942>

## Autism

- 2016  
USA [eEarth Energy Pulsating Electromagnetic Energy Fields \(PEMF\) improve Autism and Autism Spectrum Disorder \(ASD\).](#)  
WCSW Center - 2016 - e-earthenergy.homestead.com.

# Bacterial Infection Control

2013  
Australia [Evaluation of the effects of Extremely Low Frequency \(ELF\) Pulsed Electromagnetic Fields \(PEMF\) on survival of the bacterium Staphylococcus aureus.](#)  
Istiaque Ahmed, Taghrif Istivan, Irena Cosic & Elena Pirogova , EPJ Nonlinear Biomedical Physics volume 1, Article number: 5

2022  
USA [Pulsed Electromagnetic Fields Disrupt Staphylococcus epidermidis Biofilms and Enhance the Antibiofilm Efficacy of Antibiotics](#)  
Ryan B. Juncker, Beth A. Lazazzera and Fabrizio Billi, David Geffen School of Medicine at UCLA PMID: 36314923 David Geffen School of Medicine at UCLA, CA

# Birth Trauma

1989  
UK [Ultrasound and pulsed electromagnetic energy treatment for perineal trauma. A randomized placebo-controlled trial.](#)  
Grant A, Sleep J, McIntosh J, Ashurst H. Br J Obstet Gynaecol. 1989 Apr;96(4):434-9. doi: 10.1111/j.1471-0528.1989.tb02419.x. PMID: 2665802.

# Bone Healing

1977  
USA [A non-operative salvage of surgically-resistant pseudarthroses and non-unions by pulsing electromagnetic fields. A preliminary report.](#)

Bassett CAL, Pilla AA, Pawluk RJ. Orthopaedic Research Laboratories, College of Physicians and Surgeons, and Department of Chemical and Applied Engineering, Columbia University, NY, NY – The Biochemistry Section ESB, Inc. Yardley, PA.

1978  
USA [Repair of Non-Unions by Pulsing Electromagnetic Fields.](#)

Bassett CA, Mitchell SN, Norton L, Pilla A.

1982  
UK [Treatment of non-union of bone fractures by pulsing electro-magnetic fields.](#)

Hutchings J. Radiography. 1982 Feb;48(566):25-32. PMID: 6979057.

1984  
UK [Pulsed magnetic field therapy for tibial non-union. Interim results of a double-blind trial.](#)

Barker AT, Dixon RA, Sharrard WJ, Sutcliffe ML. Lancet. 1984 May 5;1(8384):994-6. doi: 10.1016/s0140-6736(84)92329-8. PMID: 6143970.

1985  
USA [The development and application of pulsed electromagnetic fields \(PEMFs\) for ununited fractures and arthrodeses.](#)

Bassett CA. Clin Plast Surg. 1985 Apr;12(2):259-77. PMID: 3886262 Review.

1989  
USA [A randomized double-blind prospective study of the efficacy of pulsed electromagnetic fields for interbody lumbar fusions.](#)

Mooney V. University of California Irvine, Division of Orthopaedic Surgery, Irvine, CA

1989  
India [Role of pulsed electromagnetic fields in recalcitrant non-unions.](#)

Delima DF, Tanna DD. J Postgrad Med. 1989 Jan;35(1):43-8. PMID: 2585337

1989  
USA [Pulsing electromagnetic field treatment in ununited fractures and failed arthrodeses.](#)

Bassett CAL, Mitchell SUN, Gaston SR(1989). JAMA (247):623-628.

1991  
UK [Healing of nonunion of a fractured lateral condyle of the humerus by pulsing electromagnetic induction.](#)

Das Sarkar S, Bassett CA., Department of Orthopaedic Surgery, Sandwell District General Hospital, Lyndon, West Midlands.

1997 [Effects of static magnetic and Pulsed Electro-Magnetic Fields on bone healing.](#)

- Australia Darendeliler MA, Darendeliler A, Sinclair PM. Discipline of Orthodontics, Faculty of Dentistry, University of Sydney.
- 1999 [Pulsed Electro-Magnetic Fields for the treatment of bone fractures.](#)
- Bangladesh Satter Syed A, Islam MS, Rabbani KS, Talukder MS. Industrial Physics Division, BCSIR Laboratories.
- 2000 [Effects of pulsed magnetic energy on a microsurgically transferred vessel.](#)
- USA Roland D, Ferder M, Kothuru R, Faierman T, Strauch B. Department of Plastic and Reconstructive Surgery at the Albert Einstein College of Medicine, Bronx, NY.
- 2004 [Pseudarthrosis after lumbar spine fusion: nonoperative salvage with Pulsed Electro-Magnetic Fields.](#)
- USA Simmons JW Jr, Mooney V, Thacker I. UTMB, Galveston, Texas.
- 2008 [The Role of Electrical Stimulation in Fracture Healing.](#) R Onibere, A Khanna.
- UK The Internet Journal of Orthopedic Surgery. 2008 Volume 11 Number 2.

## Cancer

- 1982 [Present Clinical Uses of Radio Frequency Induced Currents and Their Possible Role in The Future.](#)
- Scotland Bentall, RHC. Br J Cancer, 45, Suppl V, 82.
- 2004 [Reversal of delayed union of anterior cervical fusion treated with pulsed electromagnetic field stimulation:case report](#)
- USA Mackenzie, Donald, and Francis D Veninga. South Med J. 2004 May;97(5):519-24. doi: 10.1097/00007611-200405000-00021. PMID: 15180031.
- 2008 [Is There Still A Role For Pulsed Electromagnetic Field in the Treatment of Delayed Unions and Nonunions.](#)
- Jamaica REC Rose, Division of Orthopaedics, Department of Surgery, Radiology, Anaesthesia and Intensive Care, The University of the West Indies, BA Bryan-Frankson, Physical Therapy Solutions, El Shaddai Medical Centre.
- 2009 [Effects of pulsed electromagnetic stimulation on patients undergoing hip revision prostheses: A randomized prospective double-blind study.](#)
- Italy Dante Dallari et al., VII Division of Orthopaedic and Traumatology, Rizzoli Orthopaedic Institute, Bologna.
- 2012 [Treating cancer with amplitude-modulated electromagnetic fields: a potential paradigm shift, again?](#)
- USA C F Blackman, Integrated Systems Toxicology Division (B-105-03), US Environmental Protection Agency, Research Triangle Park, NC 27711, www.bjcancer.com Published online 17 January 2012.
- 2013 [Low intensity and frequency pulsed electromagnetic fields selectively impair breast cancer cell viability.](#)
- Switzerland Crocetti S, Beyer C, Schade G, Egli M, Fröhlich J, Franco-Obregón A. PLoS One. 2013 Sep 11;8(9):e72944. doi: 10.1371/journal.pone.0072944. eCollection 2013. PMID: 24039828.
- 2013 [Effect of pulsed electromagnetic fields on human osteoblast cultures.](#)
- Italy Barnaba S, Papalia R, Ruzzini L, Sgambato A, Maffulli N, Denaro V. Physiother Res Int. 2013 Jun;18(2):109-14. doi: 10.1002/pri.1536. Epub 2012 Sep 18. PMID: 22991203.
- 2014 [Pulsed Electromagnetic Fields \(PEMF\) Inhibit Matrix Metalloproteinase-13 Expression in Human Annulus Fibrosus Cells.](#)
- USA Xinyan Tang, Rachel Willardson, MSc, Dezba Coughlin, MD, Tamara Alliston, PhD, Jeffrey C. Lotz, MD DOI:https://doi.org/10.1016/j.spinee.2014.08.403.
- 2016 [BEMER Electromagnetic Field Therapy Reduces Cancer Cell Radioresistance by Enhanced ROS Formation and Induced DNA Damage.](#)
- Germany Storch K, Dickreuter E, Artati A, Adamski J, Cordes N. PLoS One. 2016 Dec 13;11(12):e0167931. doi: 10.1371/journal.pone.0167931. eCollection 2016. PMID: 27959944.
- 2019 [Effects of electromagnetic field on proliferation, differentiation, and mineralization of MC3T3 cells.](#)
- Singapore SH Teoh, L Suryani, JH Too, AM Hassanbhai, F Wen - dr.ntu.edu.sg.

2020  
China [Pulsed electromagnetic field \(PEMF\): A potential adjuvant treatment for infected nonunion.](#)  
X Qiu, X Li, Y Chen - Medical Hypotheses, Vol 136, March 2020, 109506.

## Carpal Tunnel Syndrome

2007  
USA [A Randomized Controlled Trial of the Effects of a Combination of Static and Dynamic Magnetic Fields on Carpal Tunnel Syndrome.](#)

Weintraub et al. Department of Neurology, New York Medical College, Valhalla, New York; Research Design Associates, Yorktown Heights, New York.

## Cartilage Healing

2005  
Italy [Effects of pulsed electromagnetic fields on articular hyaline cartilage: review of experimental and clinical studies.](#)

M. Fini. G. Giavaresi, A. Carpi, A. Nicolini, S. Setti, R. Giardino; Experimental Surgery Dept., Research Institute Codivilla-Putti-Rizzoli, Orthopedic Institute, Bologna; Dept. of Reproduction and Aging, University of Pisa, Pisa; Dept. of Internal Medicine, University of Pisa; Igea SRL, Carpi, Modena.

2016  
Netherlands [The potential application of LIPUS and PEMF on cartilage and chondrogenic differentiation.](#)

L Tan - pdfs.semanticscholar.org... University of Groningen/UMCG research database Citation for published version (APA): Tan, L.

2020  
USA [Pulsed Electromagnetic Fields Promote Repair of Focal Articular Cartilage Defects with Engineered Osteochondral Constructs](#)

Italy Robert M. Stefani, Sofia Barbosa, Andrea R. Tan, Stefania Setti, Aaron M. Stoker, Gerard A. Ateshian, Ruggero Cadossi, Gordana Vunjak-Novakovic, Roy K. Aaron, James L. Cook, J. Chloe Bulinski and Clark T. Hung. PMID: 31985051 doi: 10.1002/bit.27287

## Cell Regeneration

1986  
USA [Effect of external Pulsing Electro-Magnetic Fields on the healing of soft tissue.](#)

Glassman LS, McGrath MH, Bassett CA. Division of Plastic Surgery, Montefiore Medical Center, Albert Einstein College of Medicine, New York.

1990  
Japan [Effect of Pulsed Electro-Magnetic Fields \(PEMF\) on osteoblast-like cells.](#)

Satake T. Department of Oral Biochemistry, Kanagawa Dental College.

1993  
USA [Effects of electrical and electromagnetic stimulation after anterior cruciate ligament reconstruction.](#)

Currier DP, Ray JM, Nyland J, Rooney JG, Noteboom JT, Kellogg R., J Orthop Sports Phys Ther. 1993 Apr;17(4):177-84. doi: 10.2519/jospt.1993.17.4.177. PMID: 8467342.

2004  
USA [Stimulation of growth factor synthesis by electric and electromagnetic fields.](#)

Aaron RK, Boyan BD, Ciombor DM, Schwartz Z, Simon BJ. Clin Orthop Relat Res. 2004 Feb;(419):30-7. doi: 10.1097/00003086-200402000-00006. PMID: 15021128.

2010  
USA [119b: Pulsed Electromagnetic Fields Increase Cgmp Release From Human Endothelial Cells.](#)

Wu, JK; Rohde, CH; Adepoju, O; Lekhraj, R; Caspar, D., Plastic and Reconstructive Surgery 125(6):p 81, June 2010. | DOI: 10.1097/01.prs.0000371853.95061.b3.

2013  
Canada [A review of pulsed electromagnetic field \(PEMF\) mechanisms at a cellular level: a rationale for clinical use.](#)

Brett Wade. January 2013, American Journal of Health Research 1(3):51 DOI:10.11648/j.ajhr.20130103.13.

2016  
Hong Kong/ [Pulsed electromagnetic field \(PEMF\) promotes collagen fiber deposition associated with increased myofibroblast population in the early healing phase of diabetic wound.](#)

China Choi, MC., Cheung, KK., Li, X. et al. Pulsed electromagnetic field (PEMF) promotes collagen fibre deposition associated with increased myofibroblast population in the early healing phase of diabetic wound. *Arch Dermatol Res* 308, 21–29 (2016). <https://doi.org/10.1007/s00403-015-1604-9>.

## Circulation

- 1960 [Peripheral blood flow measurements during application of pulsed high frequency currents.](#)  
USA Erdman, WJ. *American Journal of Orthopedics*, 2:196-197, Aug 1960. University of Pennsylvania, School of Medicine, Philadelphia.
- 2004 [Microcirculatory effects of Pulsed Electro-Magnetic Fields.](#)  
USA Smith TL, Wong-Gibbons D, Maultsby J. Department of Orthopaedic Surgery, Wake Forest University School of Medicine, Medical Center Blvd., Winston-Salem, NC.
- 2006 [Limited Myocardial Muscle Necrosis Model Allowing for Evaluation of Angiogenic Treatment Modalities](#)  
USA Patel, M. et al., *Journal of Reconstructive Microsurgery*, 22, 611.
- 2006 [A pilot investigation of the effect of extremely low frequency pulsed electromagnetic fields on humans' heart rate variability.](#)  
Australia Emilio Baldi,(1,2) Claudio Baldi,(2) and Brian J. Lithgow,(1) *Bioelectromagnetics*, Volume 28, Issue 1 p. 64-68.
- 2010 [Extremely low frequency pulsed electromagnetic field designed for antinociception does not affect microvascular responsiveness to the vasodilator acetylcholine.](#)  
Canada McKay JC, Corbacio M, Tymi K, Prato FS, Thomas AW. *Bioelectromagnetics*. 2010 Jan;31(1):64-76. doi: 10.1002/bem.20533. PMID: 19644977.
- 2010 [A theoretical study of bone remodelling under PEMF at cellular level.](#)  
Australia Yanan Wang & Qing-Hua Qin. *Computer Methods in Biomechanics and Biomedical Engineering*, 27 May 2011, 15(8):885-897, <https://doi.org/10.1080/10255842.2011.565752> PMID: 21604221.

## Depression

- 2002 [Combining high and low frequencies in rTMS antidepressive treatment: preliminary results.](#)  
Austria Conca A, Di Pauli J, Beraus W, Hausmann A, Peschina W, Schneider H, Konig P, Hinterhuber H. Departments of Psychiatry I and II, Regional Hospital, Rankweil.
- 2011 [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.](#)  
Denmark P. Bech, M. Gefke, M. Lunde, L. Lauritzen and K. Martiny, Psychiatric Research Unit, Frederiksberg General Hospital, 3400 Hillerød, Denmark and Mental Health Research Unit, Psychiatric Centre, 2100 Copenhagen Ø, Denmark - Depression research, 2011 - hindawi.com.

## Diabetes

- 1992 [A Magnetic Field in the combined treatment of suppurative wounds in Diabetes Mellitus.](#)  
Russia R.A. Kuliev, R.F. Babaev. *Vestn Khir Im I I Grek*, 148 (1), January 1992, pp. 33-36.
- 2003 [The use of Pulsed Electro-Magnetic Fields with complex modulation in the treatment of patients with diabetic polyneuropathy.](#)  
Azerbaijan Musaeu, A.V., Guseinova, S.G. & Imamverdieva, S.S. *Neurosci Behav Physiol* **33**, 745–752 (2003). <https://doi.org/10.1023/A:1025184912494>.
- 2018 [Effects of pulsed electromagnetic field \(PEMF\) on the tensile biomechanical properties of diabetic wounds at different phases of healing.](#)  
Hong Kong/

China Harry M. C. Choi, Alex K. K. Cheing, Gabriel Y. F. Ng, Gladys L. Y. Cheing  
<https://doi.org/10.1371/journal.pone.0191074> - Plos one, 2018 - journals.plos.org

## Dental

1971 Reduction of dental postsurgical symptoms using non-thermal pulsed high-peak power electromagnetic energy.  
USA

Aronofsky DH. Oral Surgery, Oral Medicine, Oral Pathology, 32(5):688-696, Nov 1971.

1978 Pulsed electromagnetic energy therapy in third molar surgery.

UK Hutchinson D, Witt S, Fairpo CG. Oral Surg Oral Med Oral Pathol. 1978 Dec; 46(6):748-54. doi: 10.1016/0030-4220(78)90302-x. PMID: 282538.

1981 The adjunctive utilization of Diapulse therapy (pulsed high peak power electromagnetic energy) accelerating tissue healing in oral surgery.

USA Rhodes LC. The Quarterly of the National Dental Association, 39(4):166-175, Jul 1981 and 40(1):4-11, Oct 1981.

## Edema

1986 Effect of pulsed electromagnetic field (PEMF) in cerebral oedema.

India JAYAKUMAR K, RAJAGOPLAN T, SAMBASIVAN, BAI S. Neurology India 1986; 34:241-247.

1994 Protection against focal cerebral ischemia following exposure to a Pulsed Electro-Magnetic Field.

USA Grant G, Cadossi R, Steinberg G. Department of Neurosurgery, Stanford University, CA.

2007 Low frequency and low intensity Pulsed Electro-Magnetic Field exerts its anti-inflammatory effect through restoration of plasma membrane calcium ATPase activity.

India Selvam R, Ganesan K, Narayana Raju KV, Gangadharan AC, Manohar BM, Puvanakrishnan R. Department of Pharmacology and Toxicology, Madras Veterinary College, Vepery, Chennai.

## Endometritis

1997 A low-frequency alternating magnetic field, a supersonic-frequency current and interference currents in the combined treatment of chronic nonspecific endometritis.

Russia Strugatskii VM, Popovich LS.

## Erectile Dysfunction

2019 The Effects of pEMF on Performance.

USA Robinson, Henry S., "The Effects of pEMF on Performance" (2019). *Honors Theses*. 675.  
[https://encompass.eku.edu/honors\\_theses/675](https://encompass.eku.edu/honors_theses/675).

## Fibromyalgia

1969 Exposure to a specific pulsed low frequency magnetic field: a double-blind placebo-controlled study of effects on pain ratings in rheumatoid arthritis and fibromyalgia patients.

Canada Lawson Health Research Institute, St. Joseph's Health Care, London, Ontario.

## Hematoma

1969 Effect of pulsed electromagnetic energy (Diapulse) of experimental hematomas.

Canada FENN J: The Canadian Medical Association Journal, 160:251-254 Feb 1969.

## Hypertension

- 1991  
Russia [The treatment of hypertension patients with electro-magnetic and magnetic fields.](#)  
Orzheshkovskii VV, Chopchik DI, Paramonchik VM, Fastykovskii AD, Kovalenko VP.

## Inflammation

- 2019  
USA [The Use of Pulsed Electromagnetic Field to Modulate Inflammation and Improve Tissue Regeneration: A Review.](#)  
Christina L Ross, Yu Zhou, Charles E McCal, Shay Soker, Tracy L Criswell - Bioelectricity. 2019 Dec 1;1(4):247-259. doi: 10.1089/bioe.2019.0026. Epub 2019 Dec 12.
- 2015  
USA [Effect of pulsed electromagnetic field treatment on programmed resolution of inflammation pathway markers in human cells in culture.](#)  
Nicole J Kubat, John Moffett, Linley M Fray - J Inflamm Res. 2015 Feb 23;8:59-69. doi: 10.2147/JIR.S78631.eCollection.

## Incontinence

- 2012  
Poland [Pulsating electromagnetic field stimulation of urothelial cells induces apoptosis and diminishes necrosis: new insight to magnetic therapy in urology. 2012.](#)  
Juszczak K, Kaszuba-Zwoinska J, Thor PJ. J Physiol Pharmacol. 2012 Aug;63(4):397-401. PMID: 23070089
- 2016  
Egypt [Does sacral pulsed electromagnetic field therapy have a better effect than transcutaneous electrical nerve stimulation in patients with neurogenic overactive bladder?](#)  
Lamyaa A Fergany, Husain Shaker, Magdy Arafa, Mohamed S.Elbadry, Department of Surgery, Faculty of Physical Education, Cairo University, Cairo, Egypt, Department of Urology, Faculty of Medicine, Minia University, Minia, Egypt. Arab Journal of Urology, Volume 15, Issue 2, June 2017, Pages 148-152.
- 2017  
Italy [Electromagnetic field in control tissue regeneration, pelvic pain, neuro-inflammation and modulation of non-neuronal cells.](#)  
S E Aragona, G Mereghetti, J Lotti, A Vosa, T Lotti, E Canavesi, J Biol Regul Homeost Agents. 2017 Apr-Jun;31(2 Suppl. 2):219-225. PMID: 28702986.
- 2019  
Egypt [Efficacy Of Pulsed Electromagnetic Field Therapy On Neurogenic Bladder in Children With Myelomeningocele, \(in progress\).](#)  
Mohammed E. Ali, Ph. D Candidate, South Valley University.

## Lymphocytes

- 2002  
Russia [Effect of bioresonance therapy on antioxidant system in lymphocytes in patients with rheumatoid arthritis.](#)  
Islamov BI, Balabanova RM, Funtikov VA, Gotovskii YV, Meizerov EE. Institute of Theoretical and Experimental Biophysics, Russian Academy of Sciences, Pushchino.
- 2003  
Italy [The effect of exposure to high flux density static and pulsed magnetic fields on lymphocyte function.](#)  
Aldinucci C, Garcia JB, Palmi M, Sgaragli G, Benocci A, Meini A, Pessina F, Rossi C, Bonechi C, Pessina GP; Department of Physiology, University of Siena, Siena.

## Migraine

- 1996  
USA [Initial exploration of Pulsing Electro-Magnetic Fields for treatment of migraine.](#)  
Sherman RA, Robson L, Marden LA. Service of Orthopedic Surgery, Madigan Army Medical Center, Tacoma, WA.
- 1999 [Treatment of migraine with Pulsing Electro-Magnetic Fields: a double-blind, placebo-controlled study.](#)



- USA Sherman RA, Acosta NM, Robson L. Orthopedic Surgery Service, Madigan Army Medical Center, Tacoma, WA.
- 2001 [Impulse magnetic-field therapy for migraine and other headaches: a double-blind, placebo-controlled study.](#)  
Germany Pelka RB, Jaenicke C, Gruenwald J. Universitat der Bundeswehr Munchen, Munich.

## Multiple Sclerosis

- 1997 [Therapeutic effects of alternating current pulsed electromagnetic fields in multiple sclerosis.](#)  
USA Sandyk R. J Altern Complement Med. 1997 Winter;3(4):365-86. doi: 10.1089/acm.3.365. PMID: 9449058
- 1999 [Theory of multichannel magnetic stimulation: toward functional neuromuscular rehabilitation.](#)  
Finland Ruohonen J, Ravazzani P, Grandori F, Ilmoniemi RJ.; BioMag Laboratory, Helsinki University Central Hospital.
- 2003 [Therapy of daytime fatigue in patients with multiple sclerosis.](#)  
Austria Zifko UA., Sonderkrankenanstalt fur Neurologie, Klinik Pirawarth.
- 2003 [Effects of a Pulsed Electro-Magnetic therapy on multiple sclerosis fatigue and quality of life: a double-blind, placebo controlled trial.](#)  
USA Lappin MS, Lawrie FW, Richards TL, Kramer ED. Energy Medicine Developments, (North America), Inc., Burke, VA.

## Nerve Repair

- 1974 [The effects of pulsed electromagnetic energy on peripheral nerve regeneration.](#)  
USA Wilson DH, Jagadeesh P, Newman PP, Harriman DG. Ann N Y Acad Sci. 1974;238:575-85. doi: 10.1111/j.1749-6632.1974.tb26823.x. PMID: 4548339.
- 1980 [Clinical trials of the application of pulsating electromagnetic energy in the treatment of spinal cord lesions.](#)  
Poland KIWERSKI J, CHROSTOWSKA T, WEISS M. Narz. Ortop, Pol., 45(3):273-277
- 1984 [Results of microsurgical suture in 200 nerves.](#)  
Czechoslovakia Ionescu, D, Ionescu A. Chirurgiae Plasticae, 26(3):166-183.
- 1984 [Pulsed electromagnetic fields \(Diapulse\) alter calcium in spinal cord injury. Abstracts.](#)  
USA Young W. The First International Symposium on Central Nervous System Trauma: Restoration, Plasticity, Regeneration, 127-128 (San Francisco, CA), May 1984.
- 1991 [A multivariate approach to the treatment of peripheral nerve transection injury: the role of electro-magnetic Field Therapy.](#)  
USA Zienowicz RJ, Thomas BA, Kurtz WH, Orgel MG. University of Massachusetts Medical School, Berkshire Medical Center, Pittsfield.
- 1995 [Acute treatment with pulsed electromagnetic fields and its effect on fast axonal transport in normal and regenerating nerve.](#)  
USA Siskin BF, Jacob JM, Walker JL. J Neurosci Res. 1995 Dec;42(5):692-9. doi: 10.1002/jnr.490420512. PMID: 8600302
- 1998 [Effect of Pulsed Electro-Magnetic stimulation on facial nerve regeneration.](#)  
USA Byers JM, Clark KF, Thompson GC., Department of Otorhinolaryngology, University of Oklahoma Health Sciences Center, Oklahoma City.
- 1999 [Electro-Magnetic Fields influence NGF activity and levels following sciatic nerve transection.](#)  
USA Longo FM, Yang T, Hamilton S, Hyde JF, Walker J, Jennes L, Stach R, Siskin BF. Department of Neurology, UCSF/VAMC, San Francisco, CA.

- 2015  
Italy [Pulsed electromagnetic field \(PEMF\) prevents pro-oxidant effects of H<sub>2</sub>O<sub>2</sub> in SK-N-BE\(2\) human neuroblastoma cells.](#)  
Stefano Falone, Nicoletta Marchesi, Cecilia Osera, Lorenzo Fassina, Sergio Comincini, Maria Laura Amadio & Alessia Pascale, *Journal of Radiation*, Pages 281-286, Taylor & Francis.

## Neuropathy

- 1991  
USA [History of magnetic stimulation of the nervous system.](#)  
Geddes LA., William A. Hillenbrand Biomedical Engineering Center, Purdue University, West Lafayette, IN.
- 1998  
Russia [Magnetic and electrical stimulation in the rehabilitative treatment of patients with organic lesions of the nervous system.](#)  
Tyshkevich TG, Nikitina VV; A. L. Polenov, Russian Science Research Neurosurgical Institute, St. Petersburg.
- 2004  
USA [Pulsed magnetic field therapy in refractory neuropathic pain secondary to peripheral neuropathy: electrodiagnostic parameters—pilot study.](#)  
Weintraub MI, Cole SP. New York Medical College, Briarcliff Manor, New York, NY.
- 2007  
Austria [Short-term effects of pulsed electromagnetic fields after physical exercise are dependent on autonomic tone before exposure.](#)  
Grote V, Lackner H, Kelz C, Trapp M, Aichinger F, Puff H, Moser M. *Eur J Appl Physiol*. 2007 Nov;101(4):495-502. doi: 10.1007/s00421-007-0520-x. Epub 2007 Aug 3. PMID: 17674028.

## Nitric Oxide

- 2008  
USA [Pulsed Electromagnetic Fields Modulate cyclic GMP via a Nitric Oxide-Dependent manner in a Dopaminergic Neuronal Cell Line.](#)  
Casper, D. et al., 38th annual meeting of the Society for Neuroscience, Nov. 15 to 19, Washington, DC.
- 2008  
Switzerland [PEMF Potentiates the Induction of Nitric Oxide by Glutamate and Hydroxydopamine in a Neuronal Cell Line.](#)  
Casper, et al., BioEM 2009 Davos, Switzerland joint meeting between BEMS and EBEA, June 15-19, 2008.

## Obesity

- 2020  
Indonesia [Relative expression of PPAR \$\gamma\$  and ADIPOQ mRNA as markers of inhibition adipogenesis on mesenchymal stem cells after Pulsed Electromagnetic Field \(PEMF\).](#)  
Sari, P., Umiatin, Yunaini, L., Luviah, E., & Mazfufah, N. F. *Journal of Global Pharma Technology*, 12(1), 307-317.

## Osteoporosis

- 1989  
USA [Prevention of osteoporosis by pulsed electromagnetic fields.](#)  
Rubin CT, McLeod KJ, Lanyon LE. *J Bone Joint Surg Am*. 1989 Mar;71(3):411-7. PMID: 2925715.
- 1990  
USA [Bone density changes in osteoporosis-prone women exposed to pulsed electromagnetic fields \(PEMFs\).](#)  
Tabrah F, Hoffmeier M, Gilbert F Jr, Batkin S, Bassett CA. University of Hawaii School of Medicine, Straub Clinic and Hospital, Honolulu, HI.

## Pain

- 1988  
Italy [The Use of Low Frequency Pulsing Electromagnetic Fields in Patients with Painful Hip Prostheses.](#)  
F. P. Rispoli, F. M. Corolla & R. Mussner, *Journal of Bioelectricity*, 7:2, 181-187, DOI: 10.3109/15368378809027748.

- 1992  
Ireland [Low energy high frequency pulsed electromagnetic therapy for acute whiplash injuries. A double blind randomized controlled study.](#)  
Foley-Nolan D, Moore K, Codd M, Barry C, O'Connor P, Coughlan RJ. Scand J Rehabil Med.;24(1):51-9. PMID: 1604262.
- 1994  
USA [Electrochemical therapy of pelvic pain: effects of Pulsed Electro-Magnetic Fields \(PEMF\) on tissue trauma.](#)  
Jorgensen WA, Frome BM, Wallach C. Eur J Surg Suppl. 1994;(574):83-6. PMID: 7531030.
- 2000  
Italy [Analgesic-anti inflammatory effect of a 100 Hz variable magnetic field in RA.](#)  
Giordano N, Battisti E, Geraci S, Santacroce C, Lucani B, Fortunato M, Mattu G, Gennari C. Clin. Exp. Rheumatolog, 18(2):263.
- 2000  
USA [Pain management and electro-magnetic medicine.](#)  
Ouellette EA., University of Miami School of Medicine, Department of Orthopaedics and Rehabilitation, FL.
- 2000  
USA [Spine fusion for discogenic low back pain: outcomes in patients treated with or without Pulsed Electro-Magnetic Field stimulation.](#)  
Marks RA. Richardson Orthopaedic Surgery, Texas.
- 2002  
Austria [Evaluation of electro-magnetic fields in the treatment of pain in patients with lumbar radiculopathy or the whiplash syndrome.](#)  
Thuile Ch, Walzl M., International Society of Energy Medicine, Vienna.
- 2004  
USA [Pulsed magnetic field therapy in refractory neuropathic pain secondary to peripheral neuropathy: electrodiagnostic parameters--pilot study.](#)  
Weintraub MI, Cole SP. New York Medical College, Briarcliff Manor, New York.
- 2007  
Canada [A randomized, double-blind, placebo-controlled clinical trial using a low-frequency magnetic field in the treatment of musculoskeletal chronic pain](#)  
Alex W Thomas, Karissa Graham, Frank S Prato, Julia McKay, Patricia Morley Forster, Dwight E Moulin, Sesh Chari - Pain Res Manag. 2007 Winter;12(4):249-58.doi: 10.1155/2007/626072.
- 2007  
USA [Office Management of Chronic Pain in the Elderly](#)  
Debra K. Weiner, MD. Division of Geriatric Medicine, Department of Medicine, Department of Psychiatry and Department of Anesthesiology, University of Pittsburgh, Pittsburgh, Pa.
- 2009  
USA [Providing the understanding of the mechanism of action of PEMF therapy, the plastic surgeon is the laboratory and clinical confirmation of decreased pain and swelling following injury or surgery.](#)  
Strauch et al., Einstein College of Medicine, Bronx, NY.
- 2018  
Slovenia [Short Term Effect of PEMF Magnetotherapy on Chronic Low Back Pain.](#)  
P Galovic, D Celan, T Hernja-Rumpf, December 2018, Journal of Magnetism 23(4):553-558, OI:10.4283/JMAG.2018.23.4.553.
- 2019  
Turkey [Efficiency of pulsed electromagnetic fields on pain, disability, anxiety, depression, and quality of life in patients with cervical disc herniation: a randomized controlled study.](#)  
E Hattapoğlu, I Batmaz, Banu Dilek, Mehmet Karakoç, Serda Em, Remzi Çevik - Turk J Med Sci. 2019 Aug 8;49(4):1095-1101. doi: 10.3906/sag-1901-65.
- 2020  
Turkey [Effectiveness of pulsed electromagnetic field therapy on pain, functional status, and quality of life in patients with chronic non-specific neck pain: A prospective, randomized-controlled study.](#)  
Karakaş M, Gök H.Turk J Phys Med Rehabil. 2020 May 18;66(2):140-146. doi: 10.5606/fttrd.2020.5169. eCollection 2020 Jun.PMID: 32760890.
- 2022  
Turkey [Effectiveness of pulsed electromagnetic field therapy in the management of complex regional pain syndrome type 1: A randomized-controlled trial.](#)

Cömertoğlu İ, Güneş S, Elhan AH, Üstüner E, Kutlay Ş, Küçükdeveci AA. Turk J Phys Med Rehabil. 2022 Mar 1;68(1):107-116. doi: 10.5606/tftrd.2022.9074. eCollection 2022 Mar. PMID: 35949961

2022  
China [Efficacy of pulsed electromagnetic field on pain and physical function in patients with low back pain: A systematic review and meta-analysis](#)  
Xin Sun, Liyi Huang, Lu Wang, Chenying Fu, Qing Zhang, Hongxin Cheng, Gaiqin Pei, Yang Wang, Chengqi He, Quan Wei - Clin Rehabil. 2022 May;36(5):636-649. doi: 10.1177/02692155221074052. Epub 2022 Jan 25.

2022  
USA [Pulsed electromagnetic field \(PEMF\) as an adjunct therapy for pain management in interstitial cystitis/bladder pain syndrome.](#)  
Christina Ross, Tyler Overholt, Raymond Xu, Gopal Badlanl, Robert J Evans, Catherine A Matthews, Stephen J Walker. Int Urogynecol J. 2022 Mar;33(3):487-491. doi: 10.1007/s00192-021-04862-3, PMID: 34100976.

## Parkinson's Disease

1992  
Greece [Magnetic fields in the treatment of Parkinson's disease.](#)  
Sandyk R, Anninos PA, Tsagas N, Derpapas K. Democriton University of Thrace, Department of Medical Physics and Polytechnic School, Alexandroupolis and Xanthi.

2018  
Denmark [Effects of Long-Term Treatment with T-PEMF on Forearm Muscle Activation and Motor Function in Parkinson's Disease.](#)  
Bente Rona Jensen, Anne Sofie Bøgh Malling, Bo Mohr Morberg, Ole Gredal, Per Bech, Lene Wermuth. Case Rep Neurol (2018) 10 (2): 242–251. <https://doi.org/10.1159/000492486>.

## Perthes' Disease

1997  
UK [The results of a double-blind trial of pulsed electromagnetic frequency in the treatment of Perthes' disease.](#)  
Harrison MH, Bassett CA. J Pediatr Orthop. 1997 Mar-Apr;17(2):264-5. doi: 10.1097/00004694-199703000-00022. PMID: 9075106.

## Prostate

2017  
Egypt [Pulsed electromagnetic field with or without exercise therapy in the treatment of benign prostatic hyperplasia.](#)  
Elgohary HM, Tantawy SA. J Phys Ther Sci. 2017 Aug;29(8):1305-1310. doi: 10.1589/jpts.29.1305. Epub 2017 Aug 10. PMID: 28878453.

## Surgical Recovery

1974  
Germany [A Trial Involving the Use of Pulsed Electro- Magnetic Therapy on Children Undergoing Orchidopexy.](#)  
R.H.C. Bentall H.B. Eckstein, Z. Kinderchir, 17(4), 1975, p. 380-389.

1982  
Canada [Reduction of capsular contracture with two-stage augmentation mammoplasty and pulsed electromagnetic energy \(Diapulse therapy\).](#)  
SILVER H. Plastic and Reconstructive Surgery, 69(5):802-805, May 1982.

2005  
USA [Pulsed Electromagnetic Field Therapy in Plastic Surgery.](#)  
Brian M. Kinney MD - Aesthetic Surgery Journal, Volume 25, Issue 1, January 2005, Pages 87–91, <https://doi.org/10.1016/j.asj.2004.12.001>.

2008  
Sweden [Effects of pulsed electromagnetic fields on postoperative pain: a double-blind randomized pilot study in breast augmentation patients.](#)  
Hedén P, Pilla AA. Department of Plastic Surgery, Akademikliniken, Storängsvägen 10, 115 42, Stockholm, Aesthetic Plastic Surgery 2008 Jul;32(4):660-6. Epub 2008 May 28.

2009  
Switzerland [Effect of Pulsed Electromagnetic Fields on Post-Operative Pain: A Double-Blind Randomized Pilot Study in Breast Reduction Patients.](#)  
Rohde, C., et al., Bioelectromagnetic Society Meetings June, Davos.

- 2009  
USA [Evidence-based use of pulsed electromagnetic field therapy in clinical plastic surgery.](#)  
Strauch B, Herman C, Dabb R, Ignarro LJ, Pilla AA. *Aesthet Surg J.* 2009 Mar-Apr;29(2):135-43.
- 2009  
USA [Effects of PEMFs on IL-1beta and Post-Operative Pain.](#)  
Rohde C, Chiang A, Adipoju O, Casper D, Pilla AA.,. of Plastic and Reconstructive Surgery, Columbia University Medical Center, NY.
- 2011  
USA [Application of Pulsed Electromagnetic Fields in Foot and Ankle Surgery.](#)  
Hatic, Safet O. DO, MA; Philbin, Terrence M. II DO, FAOAO. *Application of Pulsed Electromagnetic Fields in Foot and Ankle Surgery. Techniques in Orthopaedics* 26(1):p 9-13, March 2011. | DOI: 10.1097/BTO.0b013e31820e653b.
- 2015  
USA [Pulsed electromagnetic fields dosing imp acts postoperative pain in breast reduction patients.](#)  
Taylor EM, Hardy KL, Alonso A, Pilla AA, Rohde CH. *J Surg Res.* 2015 Jan;193(1):504-10. doi: 10.1016/j.jss.2014.08.007. Epub 2014 Aug 9. PMID: 25199571 Clinical Trial.
- 2015  
USA [PEMF Accelerates Reduce Post-Operative Pain and Inflammation.](#)  
Rohde, Christine H. MD; MPH, FACS1; Taylor, Erin M. MD1; Ascherman, Jeffrey A. MD, FACS1; Hardy, Krista L. BS1; Pilla, Arthur A. PhD2. Abstract 16: PEMF Accelerates. *Plastic and Reconstructive Surgery* 135(4S):p 1185, April 2015. | DOI: 10.1097/01.prs.0000463273.25800.23.
- 2018  
USA [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.](#)  
Sorrell RG, Muhlenfeld J, Moffett J, Stevens G, Kesten S. *J Pain Res.* 2018 Jun 22;11:1209-1222. doi: 10.2147/JPR.S164303. eCollection 2018. PMID: 29950893.
- 2020  
USA [Analgesic effect of pulsed electromagnetic fields for mammoplasty: A meta-analysis of randomized controlled studies.](#)  
Li Zhang, Wei Ding, Yu Ji - *Medicine (Baltimore).* 2020 Aug 28;99(35):e21449. doi:10.1097/MD.00000000000021449.

## Range of Motion

- 1996  
Hungary [Therapy with Pulsed Electro-Magnetic Fields in aseptic loosening of total hip protheses: a prospective study.](#)  
Országos Reumatologiai és Fizioterápiás Intézet, Budapes.
- 2006  
Turkey [The effect of Pulsed Electro-Magnetic Fields in the treatment of cervical osteoarthritis: a randomized, double-blind, Sham controlled trial.](#)  
Ankara Physical Medicine and Rehabilitation Education and Research Hospital, Ankara.

## Tendonitis

- 1984  
USA [Pulsed Electro-Magnetic Field therapy of persistent rotator cuff tendinitis. A doubleblind controlled assessment.](#)  
Binder A, Parr G, Hazleman B, Fitton- Jackson S.
- 1985  
UK [Chronic lateral humeral epicondylitis--a double-blind controlled assessment of pulsed electromagnetic field therapy.](#)  
Devereaux MD, Hazleman BL, Thomas PP. *Clin Exp Rheumatol.* 1985 Oct-Dec;3(4):333-6. PMID: 4085165.
- 2014  
Italy [Studying the relation between pulsed electromagnetic field \(PEMF\) dosage and in vitro functional response of tendon cells.](#)  
Viganò M, Stanco D, Setti S, Galliera E, Sansone V, de Girolamo L. *Orthop Procs.* 2014;96-B(SUPP\_11):23-23. doi:10.1302/1358-992X.96BSUPP\_11.CORS2013-023.
- 2015  
Italy [Mechanical stimulation \(pulsed electromagnetic fields "PEMF" and extracorporeal shock wave therapy "ESWT"\) and Tendon Regeneration: A Possible Alternative.](#)

Federica Rosso, Davide E. Bonasia, Antonio Marmotti, Umberto Cottino and Roberto Rossi, Department of Orthopaedics and Traumatology, AO Mauriziano Umberto I, Torino, Italy ... - *Frontiers in aging neuroscience* - frontiersin.org.

## Tennis Elbow

- 2007 [Effectiveness of pulsed electromagnetic field therapy in lateral epicondylitis.](#)  
Turkey Uzunca K, Birtane M, Taştekin N. *Clin Rheumatol.* 2007 Jan;26(1):69-74. doi: 10.1007/s10067-006-0247-9. Epub 2006 Apr 22. PMID: 16633709.

## Ulcers

- 1978 [Pulsed high frequency currents \(Diapulse\) applied in treatment of bedsores.](#)  
Poland Duma-Drzewinska A, Buczynski ZA, Weiss M; *Polski Tygodnik Lekarski*, XXXIII(22):885-887.
- 1981 [\(1981b\). Effect of Pulsed Low-level 4 MHz Induced Currents on Human Experimental Skin Ulcers.](#)  
USA Bentall, RHC, In: *Proceedings of the 1st annual meeting of the Bioelectrical Repair and Growth Society*, p60, November 9-11, Philadelphia, PA.
- 1990 [Effect of low frequency pulsing EMFs on skin ulcers of venous origin in humans: a double-blind study.](#)  
Italy Ieran M, Zaffuto S, Bagnacani M, Annovi M, Moratti A, Cadossi R. Dept of Med Angiology, Arcispedale S. Maria Nuova, Reggio Emilia.
- 1991 [Treatment of trophic ulcers of the lower extremities using a magnetic field.](#)  
Russia Alekseenko AV, Gusak VV.
- 1991 [Treatment of chronic varicose ulcers with Pulsed Electro-Magnetic Fields: a controlled pilot study.](#)  
Ireland Department of Dermatology, Belfast City Hospital.
- 1991 [Therapy of venous ulcers using pulsating electromagnetic fields \(EMFs\).](#)  
Croatia Duran V, Zamurovic A, Stojanovic S, Poljacki M, Jovanovic M, Durisic S, Klinika za infektivne i dermatoveneroloske bolesti, Medicinski fakultet, Novi Sad.
- 1991 [Accelerated wound healing of pressure ulcers by pulsed high peak power electromagnetic energy.](#)  
USA Itoh M, Montemayor JS Jr, Matsumoto E, Eason A, Lee MH, Folk F.
- 1992 [A portable Pulsed Electro-Magnetic Field \(PEMF\) device to enhance healing of recalcitrant venous ulcers: a doubleblind, Placebo controlled clinical trial.](#)  
USA Stiller MJ, Pak GH, Shupack JL, Thaler S, Kenny C, Jondreau L. Ronald O. Perelman Department of Dermatology, New York University Medical Center, New York.
- 1993 [Use of PEMF Combined with Galvanization and Tissue Electrophoresis in the Treatment of Trophic Ulcers.](#)  
Russia A.V. Alekseenko et al. *Klein Khir* (7-8), pp. 31-34.
- 1993 [The effect of diapulse therapy on the healing of decubitus ulcer.](#)  
Romania Comorosan S, Vasilco R, Arghiropol M, Paslaru L, Jieanu V, Stelea S. Interdisciplinary Research Group, Fundeni Hospital; Bucharest, *FundRomania Journal of Physiol.*, 30 (1-2), pp. 41-45.
- 1995 [The Application of Diapulse in the Treatment of Decubitus Ulcers: Case Reports.](#)  
UK Tung, S. *Contemporary Surgery.* 47(1): 27-32.
- 1996 [The Treatment Of Pressure Sores Using Pulsed Electromagnet Energy \(PEME\).](#)  
Canada Seaborne D., Quirion-De Giradi C., Rosseau M., Rivest M., Lambert J. *Physiotherapy*, 48, 131-7.
- 1997 [Pulsing Magnetic Fields On Plantar Ulcers.](#)  
India Sarma, GR., Subrahmanyam, S., Deenabandhu, A., Babu, CR., Madhivathanan, S., Kesavaraj, N. Madras Institute of Magnetobiology, India, *Indian J Lepr.* 1997 Jul-Sept 69(3) 57-68 PMID: 9394172 UI: 98056011.

- 1999  
USA [Effect of pulsed radio frequency stimulation on wound healing: a double-blind pilot clinical study.](#)  
Kloth LC, Berman JE, Sutton CH, Jeutter DC, Pilla AA, Epner ME. Bersani F, ed. *Electricity and Magnetism in Biology and Medicine*, New York Plenum; p 875-878.
- 2008  
USA [Elimination of a pressure ulcer with electrical stimulation—a case study.](#)  
Sosa IJ, Reyes O, Kuffler DP. Section of Neurological Surgery, University of Puerto Rico, San Juan, Puerto Rico, *P R Health Sci J*. 2008 Jun;27(2):175-9.

## Vision

- 1990  
Russia [Effectiveness of magnetotherapy in optic nerve atrophy. A preliminary study.](#)  
Zobina LV, Orlovskaia LS, Sokov SL, Sabaeva GF, Konde LA, Iakovlev AA.
- 1990  
Russia [The effect of a Pulsed Electro-Magnetic Field on the hemodynamics of eyes with glaucoma.](#)  
Tsisel'skii IuV, Kashintseva LT, Skrinnik AV.
- 1996  
Russia [Possibilities of magnetotherapy in stabilization of visual function in patients with glaucoma.](#)  
Bisvas Shutanto Kumar, Listopadova NA.

## Wound Healing

- 1981  
UK [The effects of Diapulse on the healing of wounds: A double-blind randomized controlled trial in man.](#)  
Goldin, J. *British Journal of Plastic Surgery*, 34:267-270.
- 1983  
USA [Treatment of various hand injuries by pulsed electromagnetic energy \(Diapulse\).](#)  
Barclay V, Collier RJ, Jones A. *Physiotherapy*, 69(6):186-188, Jun 1983.
- 1984  
Romania [Study of efficiency of Diapulse therapy on the dynamics of enzymes in burned wound.](#)  
Ionescu A. *The Bulletin and Clinical Review of Burn Injuries*, 1(II):25-26, Apr 1984.
- 1992  
USA [Effects of pulsed electromagnetic fields on skin microvascular blood perfusion.](#)  
Mayrovitz, H. N., Larsen, P. B. *Wounds*, 4(5), 197-202.
- 1993  
USA [Therapeutic effects of electro-magnetic fields in the stimulation of connective tissue repair.](#)  
Aaron RK, Ciombor DM., Department of Orthopaedics, Brown University, Providence, RI.
- 1995  
USA [Therapeutic aspects of electromagnetic fields for soft-tissue healing.](#)  
Sisken BF, Walker J. *Advances in Chemistry Series 250*. Washington DC: American Chemical Society, 227-285.
- 1995  
USA [The effects of non-thermal pulsed electromagnetic energy on wound healing of pressure ulcers in spinal cord-injured patients: a randomized, double-blind study.](#)  
Salzberg CA, Cooper-Vastola SA, Perez F, Viehbeck MG, Byrne DW. *Ostomy Wound Manage*. 1995 Apr;41(3):42-4, 46, 48 passim. PMID: 7546114.
- 1996  
Italy [Magnetic fields in physical therapy. Experience in orthopedics and traumatology rehabilitation.](#)  
Borg MJ, Marcuccio F, Poerio AM, Vangone A., Servizio di Recupero e Rieducazione Funzionale, Napoli.
- 1996  
Argentina [Effects of magnetic fields on skin wound healing. Experimental study.](#)  
Patino O, Grana D, Bolgiani A, Prezzavento, G, Mino J, Merlo A, Benaim F. Department of Postgraduate Reconstructive and Plastic Surgery, Universidad del Salvador and Fundacion del Quemado. Buenos Aires.
- 2006  
USA [The Effect of Pulsed Electromagnetic Fields on Secondary Skin Wound Healing: An Experimental Study.](#)  
Athanasίου et al.
- 2008  
Turkey [Comparative assessment of pulsed electromagnetic fields \(PEMF\) and pulsed radio frequency energy \(PRFE\) on an in vitro wound healing model.](#)  
O Karaman, M Gümüşay, EA Demirci... - *International Journal of ...*, content.iospress.com, *European Journal of Medical Research* 19(1 ... T. Satake et al.

- 2010 [Enhanced skin permeation of naltrexone by pulsed electromagnetic fields in human skin in vitro.](#)  
Australia Krishnan G, Edwards J, Chen Y, Benson HA. J Pharm Sci. 2010 Jun;99(6):2724-31. doi: 10.1002/jps.22024. PMID: 20014281.
- 2013 [Pulsed electromagnetic field treatment in wound healing](#)  
USA Ma, Katherine C.; Baumhauer, Judith F. Current Orthopaedic Practice 24(5):p 487-492, September/October 2013. | DOI: 10.1097/BCO.0b013e3182a3d715
- 2015 [Effectiveness of an Innovative Pulsed Electromagnetic Fields Stimulation in Healing of Untreatable Skin Ulcers in the Frail Elderly: Two Case Reports](#)  
Italy Fabio Guerriero, Emanuele Botarelli, Gianni Mele, Lorenzo Polo, Daniele Zoncu, Paolo Renati, Carmelo Sgarlata, Marco Rollone, Giovanni Ricevuti, Niccolò Maurizi, Matthew Francis, Mariangela Rondanell, et al. Case Reports in Dermatological Medicine, Article ID 576580
- 2018 [Effects of pulsed electromagnetic field \(PEMF\) on the tensile biomechanical properties of diabetic wounds at different phases of healing](#)  
Hong Kong/ China Harry M. C. Choi, Alex K. K. Cheing, Gabriel Y. F. Ng., Gladys L. Y. Cheing. PMID: 29324868 doi: 10.1371/journal.pone.0191074
- 2023 [Pulsed Electromagnetic Fields \(PEMF\)—Physiological Response and Its Potential in Trauma Treatment](#)  
Austria Jonas Flatscher, Elizabeth Pavez Loriè, Rainer Mittermayr, Paul Meznik, Paul Slezak, Heinz Redl, Cyrill Slezak. PMID: 37510998 Int J Mol Sci. 2023 Jul; 24(14): 11239
- 2023 [Use of Pulse Electromagnetic Field Therapy For Non-healing Leg Ulcers](#)  
USA Deangelo Ferguson MD, Kristi Such, Sathyavani Ramanujan MD, Aamir Siddiqui MD, Henry Ford Health System, Detroit, MI; sponsored by PEMF Sysytems, Inc.

## The Science of PEMF

- 1997 [Out of My Later Years.](#)  
USA Einstein A, Citadel Press Publishers, NY
- 1993 [Possible therapeutic applications of pulsed magnetic fields.](#)  
Czech Republic Navratil L, Hlavaty V, Landsingerova E.
- 1993 [Beneficial effects of electro-magnetic fields.](#)  
USA Bassett CA., Bioelectric Research Center, Columbia University, Riverdale, NY.
- 1994 [Pulsed magnetotherapy in Czechoslovakia--a review.](#)  
Czech Republic Jerabek J. National Institute of Public Health, Praha.
- 1999 [Evolution of magnetic therapy from alternative to traditional medicine.](#)  
USA Vallbona C, Richards T.; Department of Family and Community Medicine, Baylor College of Medicine, Houston, TX.
- 2000 [Clinical effectiveness of magnetic field therapy--a review of the literature.](#)  
Germany Quittan M, Schuhfried O, Wiesinger GF, Fialka-Moser V.; Universitatsklinik fur Physikalische Medizin und Rehabilitation, Wien.
- 2007 [Pulsed electromagnetic field therapy history, state of the art and future.](#)  
USA Markov M. Environmentalist DOI 10.1007/s10669-007-9128-2.