

**National Library of Medicine:  
IGM Full Record Screen on  
*Electro Magnetic Field Therapy***

**Compiled by Innomed Africa (Pty) Ltd**

# Dermatology

## National Library of Medicine: IGM Full Record Screen

**TITLE:** Effect of low frequency pulsing electromagnetic fields on skin ulcers of venous origin in humans: a double-blind study.

**AUTHORS:** Ieran M; Zaffuto S; Bagnacani M; Annovi M; Moratti A; Cadossi R

**AUTHOR:** Department of Medical Angiology, Arcispedale S. Maria Nuova, Reggio Emilia, Italy.

**AFFILIATION:** Emilia, Italy.

**SOURCE:** J Orthop Res 1990 Mar; 8 (2): 276-82

**CITATION IDS:** PMID 2303961 UI: 90155636

**ABSTRACT:** The effect of an electromagnetic field on the healing of skin ulcers of venous origin in humans has been investigated in a double-blind study. Forty-four patients have been admitted to the study; one-half were exposed to active stimulators (experimental group) and the remaining to dummy stimulators (control group). The stimulation was scheduled to last a maximum of 90 days. The success rate was significantly higher in the experimental group both at day 90 (p less than 0.02) and in the follow-up period (p less than 0.005). The data suggest that the effect of the electromagnetic field lasts even when the stimulation is over. No ulcers worsened in the experimental group, while four worsened in the control group. Twenty-five percent of the patients in the experimental group and 50% in the control group experienced recurrence of the ulcer. It is concluded that stimulation with an electromagnetic field is a useful adjunctive therapy in the management of these patients.

**MAIN MESH HEADINGS:** \*Electromagnetic Fields  
\*Electromagnetics  
Skin Ulcer/ \*therapy

**ADDITIONAL MESH HEADINGS:** Aged  
Double-Blind Method  
Female  
Human  
Male  
Skin Ulcer/ etiology  
Skin Ulcer/ physiopathology  
Venous Insufficiency/ complications  
Wound Healing/ physiology  
1990/03  
1990/01 00:00

**PUBLICATION TYPES:** CLINICAL TRIAL  
CONTROLLED CLINICAL TRIAL  
JOURNAL ARTICLE

**LANGUAGES:** Eng

Male  
Middle Age  
Prospective Studies  
Skin/ pathology  
Support, Non-U.S. Gov't  
Support, U.S. Gov't P.H.S.  
Varicose Ulcer/ pathology  
Wound Healing/ physiology

1992/08

1992/01 00:00

**PUBLICATION  
TYPES:**

CLINICAL TRIAL  
JOURNAL ARTICLE  
MULTICENTER STUDY  
RANDOMIZED CONTROLLED TRIAL

**LANGUAGES:  
GRANT/  
CONTRACT ID:**

Eng  
AR 39749/AR/NIAMS

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## National Library of Medicine: IGM Full Record Screen

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**TITLE:** Treatment of chronic varicose ulcers with pulsed electromagnetic fields: a controlled pilot study.

**AUTHORS:** Todd DJ; Heylings DJ; Allen GE; McMillin WP

**AUTHOR:** Department of Dermatology, Belfast City Hospital.

**AFFILIATION:**

**SOURCE:** Ir Med J 1991 Jun; 84 (2):54-5

**CITATION IDS:** PMID: 1894496 UI: 91373144

**ABSTRACT:** To evaluate the efficacy of pulsed electromagnetic fields (PEMF) in healing of chronic varicose ulcers, 19 patients with this condition were included in a double-blind controlled clinical trial. All patients received standard ulcer therapy throughout the duration of study and were randomly divided into two groups to receive either active or inactive PEMF therapy. Active therapy was provided by the use of a pair of helmholtz coils on a twice weekly basis over a five week period and inactive therapy was provided on an identical regimen with identical coils wound so that no magnetic field was produced when an electric current was passed through them. The clinician and patients were unable to distinguish the active or inactive coils. No statistically relevant difference was noted between the two groups in the healing rates of the ulcer, change in the lower leg girth, pain or infection rates. However there was a trend in favour of a decrease in ulcer size and lower leg girth in the group treated with active PEMF. As PEMF is a novel treatment for chronic varicose ulcers, more work needs to be done to establish treatment parameters and its usefulness in the treatment of this condition.

**MAIN MESH HEADINGS:** \*Electromagnetic Fields

**ADDITIONAL MESH HEADINGS:** Varicose Ulcer/ \*therapy  
Aged  
Aged 80, and over  
Chronic Disease  
Double-Blind Method  
Female  
Human  
Male  
Middle Age  
Pain Measurement  
Pilot Projects  
Varicose Ulcer/ pathology  
1991/06  
1991/01 00:00

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## National Library of Medicine: IGM Full Record Screen

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**TITLE:** A portable pulsed electromagnetic field (PEMF) device to enhance healing of recalcitrant venous ulcers: a double-blind, placebo-controlled clinical trial.

**AUTHORS:** Stiller MJ; Pak GI; Shupack JL; Thaler S; Kenny C; Jondreau L

**AUTHOR:** Ronald O. Perelman Department of Dermatology, New York

**AFFILIATION:** University Medical Center, New York.

**SOURCE:** Br J Dermatol 1992 Aug; 127 (2):147-54

**CITATION IDS:** PMID: 1390143 UI: 93002349

**ABSTRACT:** A prospective, randomized, double-blind, placebo-controlled multicentre study assessed the clinical efficacy and safety of pulsed electromagnetic limb ulcer therapy (PELUT) in the healing of recalcitrant, predominantly venous leg ulcers. The portable device was used at home for 3 h daily during this 8-week clinical trial as an adjunct to a wound dressing. Wound surface area, ulcer depth and pain intensity were assessed at weeks 0, 4 and 8. At week 8 the active group had a 47.7% decrease in wound surface area vs. a 42.3% increase for placebo ( $P < 0.0002$ ). Investigators' global evaluations indicated that 50% of the ulcers in the active group healed or markedly improved vs. 0% in the placebo group, and 0% of the active group worsened vs. 54% of the placebo group ( $P < 0.001$ ). Significant decreases in wound depth ( $P < 0.04$ ) and pain intensity ( $P < 0.04$ ) favouring the active group were seen. Patients whose ulcers improved significantly after 8 weeks were permitted to continue double-blind therapy for an additional 4 weeks. Eleven active and one placebo patient continued therapy until week 12, with the active treatment group continuing to show improvement. There were no reports of adverse events attributable to this device. We conclude that the PELUT device is a safe and effective adjunct to non-surgical therapy for recalcitrant venous leg ulcers.

**MAIN MESH HEADINGS:** Electric Stimulation Therapy/ \*methods  
\*Electromagnetic Fields  
Varicose Ulcer/\*therapy

**ADDITIONAL MESH HEADINGS:** Adult  
Aged  
Aged 80, and over  
Combined Modality Therapy  
Double-Blind Method  
Electric Stimulation Therapy/ instrumentation  
Female  
Human

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## National Library of Medicine: IGM Full Record Screen

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**TITLE:** The effect diapulse therapy on the healing of decubitus ulcer.  
**AUTHORS:** Comorosan S; Vasilco R; Arghiropol M; Paslaru L; Jieanu V; Stelea S

**AUTHOR:** Interdisciplinary Research Group, Fundeni Hospital, Bucharest,  
**AFFILIATION:** Romania  
**SOURCE:** Rom J Physiol 1993 Jan-Jun;30(1-2):41-5  
**CITATION IDS:** PMID: 7982015 UI: 95072987  
**ABSTRACT:** The effect of pulsed high peak power electromagnetic field (Diapulse) on treatment of pressure ulcers is under investigation. 20 elderly patients, aged from 60 to 84, hospitalized with chronic conditions and bearing long-standing pressure ulcers are subjected to Diapulse sessions (1-2 daily), parallel to conventional treatment. 5 patients undergo conventional therapy, serving as control and 5 others follow conventional+placebo Diapulse treatment. All patients were daily monitored, concerning their clinical status and ulcers' healing. After a maximum 2-weeks treatment, bulge healing rate was, as follows: 85% excellent and 15% very good healing under Diapulse therapy; in the placebo group, 80% patients show no improvement and 20% poor improvement in the controll group, 60% patients show no improvement and 40% poor improvement of ulcers. This investigation strongly advises for Diapulse treatment as a modern, uninvasive therapy of great efficiency and low social costs in resolving a serious, widespread medical problem.

**MAIN MESH HEADINGS:** Decubitus Ulcer/\*therapy  
\*Electric Stimulation Therapy  
\*Electromagnetic Fields

**ADDITIONAL MESH HEADINGS:** Aged  
Aged, 80 and over  
Female  
Human  
Male  
Middle Age  
Placebos  
Time factors  
Treatment Outcome  
1993/01  
1993/01 00:00

**PUBLICATION TYPES:** CLINICAL TRIAL  
JOURNAL ARTICLE  
**CAS REGISTRY NUMBERS:** 0 (Placebos)

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**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** Pulsed electromagnetic fields in experimental cutaneous wound healing in Rats.

**AUTHORS:** Patino O; Grana D; Bolgiani A; Prezzavento G; Mino J; Merlo A; Benaim F

**AUTHOR:** Department of Postgraduate Reconstructive and Plastic Surgery,

**AFFILIATION:** Universidad del Salvador and Fundacion del Quemado.

**SOURCE:** J Burn Care Rehabil 1996 Nov-Dec; 17(6 Pt 1):528-31

**CITATION IDS:** PMID:8951540 UI: 97109260

**ABSTRACT:** Electromagnetic fields are now being used in many diseases such as osseous, ligamental, cartilaginous, or nervous reparation, diabetes and myocardial or cerebral ischemia. Although many publications show the usefulness of magneto-therapy, discrepancies exist about the utility of electromagnetic fields in skin wound healing. The objective of this work was to study the effect of pulsed electromagnetic fields on wound healing in rats. Twenty-two male Wistar rats were used; a circular lesion was made in the back of each animal. They were divided into three groups: group C (control) with sham treatment (n = 8), group NF, treated with topical nitrofurazone solution (n = 7), and group PEMF, treated with pulsed electromagnetic fields of 20 m T (n = 7). The treatments were 35 minutes twice a day. The absolute and relative values of the area and perimeter of the wounds showed significantly lower values PEMF group at days 7, 14, and 21 compared with those in group C ( $p < 0.01$ , analysis of variance), whereas the PEMF group showed significantly lower values at day 21 only compared with the NF group ( $p < 0.01$ , analysis of variance). The results suggest a significantly beneficial stimulation in the wound healing process in rats treated with PEMF, which could lead to the development of a practical tool for research and clinical use.

**MAIN MESH HEADINGS:** Anti-Infective Agents, Local/ \*therapeutic use  
\*Electromagnetic Fields  
Nitrofurazone/ \*therapeutic use  
Wound Healing/ \*radiation effects  
Wounds and Injuries/ \*therapy

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**ADDITIONAL MESH HEADINGS:** Administration, Topical  
Analysis of Variance  
Animal  
Anti-Infective Agents, Local/ administration & dosage  
Comparative Study  
Disease Models, Animal  
Male  
Nitrofurazone/ administration & dosage  
Rats  
Rats, Wistar  
1996/11  
1996/01 00:00

**PUBLICATION TYPES:** JOURNAL ARTICLE

**CAS REGISTRY NUMBERS:** 0 (Anti-Infective Agents, Local)  
59-87-0 (Nitrofurazone)

**LANGUAGES:** Eng

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# Orthopedics Rheumatology

**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** Pulsed electromagnetic field therapy of persistent rotator cuff tendinitis. A double-blind controlled assessment.

**AUTHORS:** Binder A; Parr G; Hazleman B; Fitton-Jackson S

**SOURCE:** Lancet 1984 Mar 31; 1(8379): 695-8

**CITATION IDS:** PMID: 6143039 UI: 84166793

**ABSTRACT:** The value of pulsed electromagnetic fields (PEMF) for the treatment of persistent rotator cuff tendinitis was tested in a double-blind controlled study in 29 patients whose symptoms were refractory to steroid injection and other conventional conservative measures. The treated group (15 patients) had a significant benefit compared with the control group (14 patients) during the first 4 weeks of the study, when the control group received a placebo. In the second 4 weeks, when all patients were on active coils, no significant differences were noted between the groups. This lack of difference persisted over the third phase, when neither group received any treatment for 8 weeks. At the end of the study 19 (65%) of the 29 patients were symptomless and 5 others much improved. PEMF therapy may thus be useful in the treatment of severe and persistent rotator cuff and possibly other chronic tendon lesions.

**MAIN MESH HEADINGS:** Electromagnetic Fields/ \*therapeutic use  
Electromagnetics/ \*therapeutic use  
\*Shoulder Joint  
Tendinitis/ \*therapy

**ADDITIONAL MESH HEADINGS:** Clinical Trials  
Double-Blind Method  
Female  
Human  
Male  
Methods  
Middle Age  
Movement  
Pain/ physiopathology  
Pain/ therapy  
Random Allocation  
Rotation  
Shoulder Joint/ physiopathology  
Support, Non-U.S. Gov't  
1984/03  
1984/31 00:00

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**MAIN MESH HEADINGS:** Cervical Vertebrae/ \*physiopathology  
\*Electromagnetic Fields

Knee Joint/ \*physiopathology  
Osteoarthritis/ \*therapy

**ADDITIONAL MESH HEADINGS**

Aged  
Aged, 80 and over  
Double-Blind Method  
Female  
Follow-up Studies  
Human  
Male  
Middle Aged  
Osteoarthritis/ physiopathology  
Pain/ physiopathology  
Support, Non-U.S. Gov't  
1994/10  
1994/01 00:00

**PUBLICATION TYPES:**

CLINICAL TRIAL  
JOURNAL ARTICLE  
META-ANALYSIS  
MULTICENTER STUDY  
RANDOMIZED CONTROLLED TRIAL

**LANGUAGES:**

Eng

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**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** A double-blind trial of the clinical effects of pulsed electromagnetic fields in osteoarthritis (see comments)

**AUTHORS:** Trock DH; Bollet AJ; Dyer RH Jr; Fielding LP; Miner WK; Markoll R

**AUTHOR:** Department of Medicine (Rheumatology), Danbury Hospital, CT 06810.

**AFFILIATION:**

**SOURCE:** J Rheumatol 1993 Mar; 20(3): 456-60

**CITATION IDS:** PMID: 8478852 UI: 93240431

**COMMENT:** Comment in: J Rheumatol 1993 Dec; 20(12):2166-7

**ABSTRACT:** OBJECTIVE. Further evaluation of pulsed electromagnetic fields (PEMF), which have been observed to produced numerous biological effects, and have been used to treat delayed union fractures for over a decade. METHODS. In a pilot, double-blind randomized trial, 27 patients with osteoarthritis (OA), primarily of the knee were treated with PEMF. Treatment consisted of 18 half-hour periods of exposure over about 1 month in a specially designed noncontact, air-coil device. Observations were maid on 6 clinical variables at baseline, midpoint of therapy, end of treatment and one month later, 25 patients completed treatment. RESULTS. An average improvement of 23-61% occurred in the clinical variables observed with active treatment. While 2 to 18% improvement was observed in these variables in placebo treated control patients. No toxicity was observed. CONCLUSION. The decreased pain and improved functional performance of treated patients suggests that this configuration of PEMF has potential as an effective method of improving symptoms in patients with OA. This method warrants further clinical investigation.

**MAIN MESH HEADINGS:** \*Electromagnetic Fields

**ADDITIONAL MESH HEADINGS:** Osteoarthritis/ \*therapy  
Double-Blind Method  
Female  
Human  
Osteoarthritis/ epidemiology  
Pilot Projects  
Support, Non-U.S. Gov't  
Time Factors  
1993/03  
1993/01 00:00

**PUBLICATION TYPES:** CLINICAL TRIAL  
JOURNAL ARTICLE  
RANDOMIZED CONTROLLED TRIAL

**LANGUAGES:** Eng

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**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** Electromagnetic Fields and magnets. Investigational treatment for musculoskeletal disorders.

**AUTHORS:** Trock DH

**AUTHOR:** Yale University School of Medicine, New Haven, Connecticut, USA.

**AFFILIATION:**

**SOURCE:** Rheum Dis Clin North Am 2000 Feb;26(1):51-62, viii

**CITATION:** PMID: 10680193 UI: 20144445

**ABSTRACT:** Certain pulsed electromagnetic fields (PEMF) affect the growth of bone and cartilage in vitro, with potential application as an arthritis treatment. PEMF stimulation is already a proven remedy for delayed fractures, with potential clinical application for osteoarthritis, osteonecrosis of bone, osteoporosis, and wound healing. Static magnets may provide temporary pain relief under certain circumstances. In both cases, the available data is limited. The mechanisms underlying the use of PEMF and magnets are discussed.

**MAIN MESH HEADINGS:** Electric Stimulation Therapy/ \*methods  
\*Electromagnetic Fields  
Magnetics/ \*therapeutic use  
Musculoskeletal Diseases/ \*therapy

**ADDITIONAL MESH HEADINGS:** Alternative Medicine/ methods  
Human  
2000/03  
2000/25 09:00

**PUBLICATION TYPES:** JOURNAL ARTICLE  
REVIEW  
REVIEW, TUTORIAL

**LANGUAGES:** Eng

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**National Library of Medicine IGM: Full Record Screen**

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**TITLE:** Effects of pulsed electromagnetic fields on human chondrocytes: an in vitro study.

**AUTHORS:** Pezzetti F; De Mattei M; Caruso A; Cadossi R; Zucchini P; Carinci F; Traina GC; Sollazzo V

**AUTHOR:** Dipartimento di Morfologia ed Embriologia, Universita di Ferrara, via

**AFFILIATION:** Fossato di Mortara 64, 44100 Ferrara, Italy.

**SOURCE:** Calcif Tissue Int 1999 Nov;65(5):396-401

**CITATION** PMID: 10541767 UI: 20009325

**IDS:**

**ABSTRACT:** (3)H-thymidine incorporation was studied in cultured human nasal and articular chondrocytes exposed to low-energy. Low-frequency pulsed electromagnetic fields (PEMFs) (75Hz,2.3 mT). The reverse transcriptase polymerase chain reaction (RT-PCR) analysis shows that human secondary chondrocytes derived from both nasal and articular cartilage express collagen type II mRNA, which is a specific marker of the chondrocyte phenotype. In a preliminary series of experiments, cells were exposed to PEMF for different time periods ranging from 6 to 30 hours (time-course), in medium supplemented with 10% or 0.5% fetal calf serum (FCS) and in serum-free medium. The ratios between the (3) H thymidine incorporation in PEMFs and control cultures show an increase of the cell proliferation in cultures exposed to PEMFs when serum is present in the culture medium, whereas no effect was observed in serum-free conditions. The increase in DNA synthesis, induced by PEMFs, was then evaluated only at the times of maximum induction and the results were analyzed by the three-factor analysis of variance (ANOVA). The data presented in this study show that even if (3) H-thymidine incorporation is higher in nasal than in articular chondrocytes, PEMF induce an increase in the proliferation of both cell types. Moreover, the concentration of FCS in the culture medium greatly influences proliferative response of human chondrocytes to the PEMF exposure. Though normal human osteoblast cells increase their proliferation when exposed to PEMFs if only 10% FCS is present in the medium, human chondrocytes are able to increase their cell proliferation when exposed PEMFs in the presents of both 0.5% and 10% of FCS in the medium. The results obtained may help to explain the basic mechanisms of PEMF stimulation of fracture healing.

**MAIN MESH HEADINGS:** Chondrocytes/ \*physiology  
Collagen/ \*metabolism  
\*Electromagnetic Fields

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**ADDITIONAL  
MESH  
HEADINGS:** Adolescence  
Adult  
Aged  
Analysis of Variance  
Cartilage/ cytology  
Cell Division  
Cells, Cultured  
Chondrocytes/ cytology  
Collagen/ genetics  
Comparative Study  
Culture Media/ chemistry  
Female  
Human  
Male  
Middle Age  
Nasal Septum/ cytology  
Polymerase Chain Reaction  
RNA, Messenger/ metabolism  
Support, Non-U.S. Gov't  
Time Factors  
1999/12  
1999/14 09:00

**PUBLICATIONS  
TYPES:** JOURNAL ARTICLE

**CAS  
REGISTRY  
NUMBERS:** 0 (Culture Media)  
0 (RNA, Messenger)  
9007-34-5 (Collagen)

**LANGUAGES:** Eng

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## National Library of Medicine: IGM Full Record Screen

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**TITLE:** The effect of pulsed electromagnetic fields in the treatment of osteoarthritis of the knee and cervical spine, Report of randomized, double-blind, placebo controlled trials.

**AUTHORS:** Trock DH; Bollet AJ; Markoll R

**AUTHOR:** Department of Medicine, Danbury Hospital, CT.

**AFFILIATION:**

**SOURCE:** J Rheumatol 1994 Oct;21(10):1903-11

**CITATION** PMID: 7837158 UI: 95138950

**IDS:**

**ABSTRACT:** **OBJECTIVE.**, We have conducted a randomized double-blind clinical trial to determine the effectiveness of pulsed electromagnetic fields (PEMF) in the treatment of osteoarthritis (OA) of the knee and cervical spine. **METHODS.** A controlled trial of 18 half-hour active or placebo treatments was conducted in 86 patients with OA of the knee and 81 patients with OA of the cervical spine, in which pain was evaluated using a 10cm visual analog scale, activities of daily living using a series of questions (answered by the patient as never, sometimes, most of the time, or always), pain on passive motion (recorded as none, slight, moderate, or severe), and joint tenderness (recorded using a modified Ritchie scale). Global evaluations of improvement were made by the patient and examining physician. Evaluations were made at the baseline, midway, end of treatment and one month after completion of the treatment. **RESULTS.** Matched pair t tests showed extremely significant changes from baseline for the treated patients in both knee and cervical spine studies at the end of treatment and the one month follow-up observations, whereas the changes in the placebo patients showed lesser degrees of significance at the end of treatment, and had lost significance for most variables at the one month follow-up. Means of the treated group of patients with OA of the knee showed greater improvement from baseline values than the placebo group by the end of treatment at the end of the month follow-up observation. Using the 2-tailed t test, at the end of treatment the differences in the means of the 2 groups reached statistical significance for pain, pain on motion, and both the patient overall assessment and the physician global assessment. The means of the treated patients with the OA of the cervical spine showed greater improvement from baseline than the placebo group for most variables at the end of treatment and one month follow-up observations; these differences reached statistical significance at one or more observation points for pain on motion, and tenderness. **CONCLUSION.** PEMF has therapeutic benefit in painful OA of the knee or cervical spine.

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**ADDITIONAL MESH HEADINGS:** Adolescence  
Adult  
Bone Neoplasms/ drug therapy  
Bone Neoplasms/ radiography  
Bone Neoplasms/ surgery  
Child  
Double-Blind Method  
Female  
Human  
Male  
Osseo integration/ drug effects  
Prospective Studies  
Time Factors  
Transplantation, Homologous  
1994/09  
1994/01 00:00

**PUBLICATION TYPES:** CLINICAL TRIAL  
JOURNAL ARTICLE  
RANDOMIZED CONTROLLED TRIAL

**LANGUAGES:** Eng

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## National Library of Medicine: IGM Full Record Screen

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**TITLE:** Effects of pulsed electromagnetic fields on Steinberg ratings of femoral head osteoporosis.

**AUTHORS:** Bassett CA; Schink-Ascani M; Lewis SM

**AUTHOR:** New York Orthopaedic Hospital, Columbia Presbyterian Medical Center, Riverdale, NY 10463.

**AFFILIATION:** Riverdale, NY 10463.

**SOURCE:** Clin Orthop 1989 Sep;(246):172-85

**CITATION IDS:** PMID: 2670386 UI: 89355596

**ABSTRACT:** Between 1979 and 1985, 95 patients with femoral head osteonecrosis met the protocol for treatment of 118 hips with selected pulsed electromagnetic fields (PEMFs). Etiologies included trauma (17), alcohol (9), steroid use (46), sickle cell disease (2), and idiopathy (44). The average age was 38 years, and the average follow-up period since the onset of symptoms was 5.3 years. PEMF treatment had been instituted an average of 4.1 years earlier. By the Steinberg quantitative staging method of roentgenographic analysis, none of the 15 hips in Stages 0-III of 79 hips showed progression, and grading improved in nine of 15. Eighteen of 79 hips (23%) with Stage IV lesions progressed and none improved. In the Stage V category, one of 21 hips (5%) worsened and none improved. Three Stage VI lesions were unchanged. The overall rate of quantified progression for the 118 hips, 87% of which had collapse present when entering the program, was 16%. This value represents a reversal of the percentage of progression reported recently by other investigators using conservation and selected surgical methods. PEMF patients also have experienced long-term improvements in symptoms and signs, together with a reduction in the need for early joint arthroplasty.

**MAIN MESH HEADINGS:** Electromagnetic Fields/ \*therapeutic use  
Electromagnetics/ \*therapeutic use  
Femur Head Necrosis/ \*therapy

**ADDITIONAL MESH HEADINGS:** Adult  
Clinical Trials  
Female  
Femur Head Necrosis/ etiology  
Femur Head Necrosis/ radiography  
Follow-Up Studies  
Hip Joint/ radiography  
Human  
Male  
Middle Age  
Time Factors  
1989/09

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## National Library of Medicine: IGM Full Record Screen

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**TITLE:** Effect of pulsed electromagnetic fields on bone formation and bone loss during limb lengthening.

**AUTHORS:** Eyres KS; Saleh M; Kanis JA

**AUTHOR:** WHO Collaborating Centre for Metabolic Bone Disease, University of

**AFFILIATION:** Sheffield Medical School, UK.

**SOURCE:** Bone 1996 Jun;18(6):505-9

**CITATION IDS:** PMID: 8805989 UI: 96399518

**ABSTRACT:** We examined the effect of pulsed electromagnetic fields (PEMFs) on bone formation and disuse osteoporosis sustained during limb lengthening in a double-blind study. Seven males (mean age 13 years, range 11-19 years) and six females (mean age 12 years, range 9-19 years) were randomly allocated to receive either or an inactive PEMF coil. Limb lengthening was performed by the Villarubbias technique using either a unilateral or circular frame system. Sequential bone density measurements were made using dual energy X-ray absorptiometry and compared to traditional radiographs. Ten segments (eight tibial and two femoral) in seven patients were lengthened under the influence of active coils and eight segments (six tibial and two femoral) in six patients using inactive coils. There was no difference in the rate nor the amount of new bone formed at the site of distraction between the two groups. Bone loss in the segments of bone distal to the lengthening sites was observed in both groups but was significantly more marked using inactive coils (BMD reduced by 23% +/- SEM 3% and 33% +/- 4% control values after one and two months, respectively;  $p < 0.0001$ ) than using active coils (BMD reduced by 10% +/- 2% at 2 months). These differences were greater at 12 months after surgery (reduced by 54% +/- 5% and 13% +/- 4%, respectively;  $p < 0.0001$ ). Stimulation with pulsed electromagnetic fields has no effect on the regenerate bone, but does prevent bone loss adjacent to the distraction gap.

**MAIN MESH HEADINGS:** Bone Development/ \*physiology  
\*Bone Lengthening  
\*Electromagnetic Fields  
Leg/ \*surgery  
Osteoporosis/ \*physiopathology

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**ADDITIONAL  
MESH  
HEADINGS:** Adolescence  
Adult  
Bone Density/ physiology  
Child  
Osteoporosis/ prevention & control Child  
Densitometry, X-Ray  
Double-Blind Method  
Female  
Femur/ physiology  
Human  
Male  
Osteoporosis/ prevention & control  
Osteotomy  
Prospective Studies  
Tibia/ physiology  
1996/06  
1996/01 00:00

**PUBLICATION  
TYPES:** CLINICAL TRIAL  
JOURNAL ARTICLE  
RANDOMIZED CONTROLLED TRIAL

**LANGUAGES:** Eng

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**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** Electrical stimulation of human femoral intertrochanteric osteotomies  
Double-blind study.

**AUTHORS:** Borsalino G; Bagnacani M; Bettati E; Fornaciari F; Rocchi R; Uluhogian S; Ceccherelli G; Cadossi R; Traina GC

**AUTHOR:** Department of Orthopaedics and Traumatology, Montecchio Hospital

**AFFILIATION:** Reggio Emilia, Italy.

**SOURCE:** Clin Orthop 1988 Dec;(237):256-63

**CITATION IDS:** PMID: 3191636 UI: 89052140

**ABSTRACT:** Low-frequency pulsing electromagnetic fields (PEMF) are being used in nonunion healing at several centers around the world. Much debate exist about quantification of PEMF effects, especially in humans where no randomized studies have been performed. The results of a double-blind treatment of 32 consecutive patients treated with femoral intetrochanteric osteotomy for hip degenerative arthritis are reported. Roentgenographic evaluation and callus density measurements performed with an image analyzer showed a statistically significant difference between controls and stimulated patients ( $p$  less than 0.01). In this extremely homogeneous patient population, PEMF stimulation favored osteotomy healing.

**MAIN MESH HEADINGS:** Electromagnetic Fields/ \*therapeutic use  
Electromagnetics/ \*therapeutic use  
Femur/ \*surgery  
Osteoarthritis, Hip/ \*surgery  
Osteotomy/ \*methods

**ADDITIONAL MESH HEADINGS:** Adult  
Aged  
Bone Plates  
Bony Callus  
Double-Blind Method  
Female  
Hip/ radiography

**PUBLICATION TYPES:** CLINICAL TRIAL  
CONTROLLED CLINICAL TRIAL  
JOURNAL ARTICLE

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**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** Osteonecrosis of the femoral head treated by pulsed electromagnetic fields (PEMFs): a preliminary report.

**AUTHORS:** Eftekhari NS; Schink-Ascani MM; Mitchell SN; Bassett CA

**SOURCE:** Hip 1983;;306-30

**CITATION IDS:** PMID: 6671918 UI: 84161339

**ABSTRACT:** This has been a preliminary report with a short-term follow-up of a small number of observations (28 hips of 24 patients). The follow-ups ranged from 6 to 36 months, with an average of 17.8 months. Only eleven hips (in eleven patients) were followed an average of 8 months after cessation of the treatment. It should be emphasized that this was a "pilot" study, in which no control series was used to determine the natural course of the disease in a comparable clinical setting. Of note was the pain relief, in 19 of 23 patients with moderate to severe pretreatment pain. Also there was an improved function, which suggests that at least in approximately two thirds of the patients there was some clinical benefit from this mode of treatment. In eight hips, clinical conditions did not change; and in two they worsened, requiring further treatment. Eighteen remaining hips were thought to have benefited by the treatment. Six femoral heads that had already developed varying degrees of collapse (Ficat Type III) collapsed further (1 to 2mm), and two round heads (Ficat II) progressed to off-round (Ficat III). This preliminary study suggests that further exploration of pulsed electromagnetic fields (PEMFs) is warranted in the treatment of osteonecrosis of the femoral head.

**MAIN MESH HEADINGS:** Electromagnetic Fields/ \*therapeutic use  
Electromagnetics/ \*therapeutic use  
Femur Head Necrosis/ \*therapy

**ADDITIONAL MESH HEADINGS:** Adolescence  
Adult  
Aged  
Case Report  
Female  
Femur Head Necrosis/ diagnosis  
Femur Head Necrosis/ surgery  
Follow-Up Studies  
Human  
Male  
Middle Age  
1983/01  
1983/01 00:00

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**National Library Of Medicine: IGM Full Record Screen**

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**TITLE:** Protection against focal cerebral ischemia following exposure to a pulsed electromagnetic field.

**AUTHORS:** Grant G; Cadossi R; Steinberg G

**AUTHOR:** Department of Neurosurgery, Stanford University, California

**AFFILIATION:** 94305.

**SOURCE:** Bioelectromagnetics 1994;15(3):205-16

**CITATION IDS:** PMID: 8074737 UI: 94354894

**ABSTRACT:** There is evidence that electromagnetic stimulation may accelerate the healing of tissue damage following ischemia. We undertook this study to investigate the effects of low frequency pulsed electromagnetic field (PEMF) exposure on cerebral injury in a rabbit model of transient focal ischemia (2 h occlusion followed by 4 h of reperfusion). PEMF exposure (280 V, 75Hz, IGEA Stimulator) was initiated 10 min after the onset of ischemia and continued throughout reperfusion (six exposed, six controls). Magnetic resonance imaging (MRI) and histology were used to measure the degree of ischemic injury. Exposure to pulsed electromagnetic field attenuated cortical ischemia edema on MRI at the most anterior coronal level by 65% (P<0.001). On histologic examination, PEMF exposure reduced ischemic neuronal damage in this same cortical area by 69% (P<0.01). and 43% (P<0.05) in the striatum. Preliminary data suggest that exposure to a PEMF of short duration may have implications for the treatment of acute stroke.

**MAIN MESH HEADINGS:** \*Electromagnetic Fields

**ADDITIONAL MESH HEADINGS:** Ischemic Attack, Transient/ \*prevention & control  
Animal

**HEADINGS:** Brain Damage, Chronic/ pathology  
Brain Damage, Chronic/ prevention & control  
Brain Damage, Chronic/ physiopathology  
Brain Edema/ prevention & control  
Brain Edema/ physiopathology  
Cerebral Cortex/ pathology  
Cerebral Cortex/ radiation effects  
Cerebrovascular Disorders/ prevention & control  
Cerebrovascular Disorders/ physiopathology  
Evoked Potentials, Somatosensory/ physiology  
Evoked Potentials, Somatosensory radiation effects  
Ischemic Attack, Transient/ pathology  
Ischemic Attack, Transient physiopathology  
Magnetic Resonance Imaging

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**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** Effect of weak electromagnetic fields on body image perception in patients with multiple sclerosis.

**AUTHORS:** Sandyk R

**AUTHOR:** NeuroCommunication Research Laboratories, Danbury, CT 06811, USA.

**AFFILIATION:**

**SOURCE:** Int J Neurosci 1996 Jul;86(1-2):79-85

**CITATION IDS:** PMID: 8828062 UI: 96425720

**ABSTRACT:** Cerebellar ataxia is one of the most disabling symptoms of multiple sclerosis (MS) and also one of the least responsive to pharmacotherapy. However, cerebellar symptoms often improve dramatically in MS patients by brief, extracerebral applications of picotesla flux electromagnetic fields (EMFs). This report concerns two MS patients with chronic disabling ataxia who experienced rapid improvement in gait and balance after receiving a series of treatments with EMFs. To assess whether improvement in cerebellar gait is accompanied by changes in body image perception, a parietal lobe function, both patients were administered the Human Figure Drawing Test before and after a series of brief treatments with EMFs. Prior to application of EMFs these patients' free drawings of a person showed a figure with a wide-based stance characteristic of cerebellar ataxia. After receiving a series of EMFs treatments both patients demonstrated a change in body image perception with the drawings of the human figure showing a normal stance. These demonstrate that in MS improvement in cerebellar symptoms by pulsed applications of picotesla EMFs is associated with changes in the body image.

**MAIN MESH HEADINGS:** \*Body Image  
\*Electromagnetic Fields  
Multiple Sclerosis/ \*psychology

**ADDITIONAL MESH HEADINGS:** Adult  
Case Report  
Cerebellar Ataxia/ etiology  
Cerebellar Ataxia/ physiopathology  
Cognition/ physiology  
Equilibrium/ physiology  
Female  
Gait/ physiology  
Human  
Male  
Multiple Sclerosis/ complications  
Multiple Sclerosis/ therapy

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**ADDITIONAL  
MESH  
HEADINGS:** Aged  
Antiparkinson Agents/ therapeutic use  
Case Report  
Combined Modality Therapy  
Female  
Human  
Levodopa/ therapeutic use  
Male  
Middle Age  
Parkinson Disease/ drug therapy  
Parkinson Disease/ psychology  
Psychomotor Performance/ radiation effects  
1996/03  
1996/01 00:00

**PUBLICATION  
TYPES:** JOURNAL ARTICLE

**CAS  
REGISTRY  
NUMBERS:** 0 (Antiparkinson Agents)  
0 (Levodopa)

**LANGUAGES:** Eng

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**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** Effect of PEMF on fresh fracture-healing in rat tibia.

**AUTHORS:** Sarker AB; Nashimuddin AN; Islam KM; Rabbani KS; Rahman M; Mushin AU; Hussain M

**AUTHOR:** Department of Pathology, Okayama University Medical School, Japan.

**AFFILIATION:**

**SOURCE:** Bangladesh Med Res Counc Bull 1993 Dec;19(3):103-12

**CITATION IDS:** PMID: 8031284 UI: 94304390

**ABSTRACT:** The present experiment was designed to find out whether PEMF can act as a healing agent on induced fracture of rat tibia. Eighty rats were taken for this experiment. Under general anaesthesia mid-shaft of tibia and fibula of all rats were osteotomied, Intramedullary nailing was done for proper alignment of the fractured fragments. The animals were then divided into two groups: group-1 and Group-II. Each group contained forty animals. Out of these forty animals twenty were treated as experimental and twenty as control. From the third day of osteotomy, PEMF was applied to experimental rats around the osteotomy sites for a period of nine hours a day. PEMF was not applied to the control rats. The animals of group-1 and group-II were sacrificed after applied one week and three weeks of PEMF, respectively. Radiological and microscopical examination of the callus were performed. Gross and microscopic measurements of the callus were statistically analysed. The growth of callus was taken as a criterion of fracture healing. The results of the present experiment revealed significant enhancement of fracture healing in group-1. The results of the radiological evaluation of group-II experimental animals were also consistent with the morphological analysis. It was concluded that healing of fractured rat tibia was enhanced by the application of PEMF and this effect of PEMF was more pronounced at the end of third week.

**MAIN MESH HEADINGS:** \*Electromagnetic Fields  
\*Fracture Healing  
Tibia/ \*injuries

**ADDITIONAL MESH HEADINGS:** Animal  
Electric Stimulation  
Female  
Male  
Rats  
Rats, Inbred Strains  
Tibia/ pathology  
Tibia/ physiology  
1993/12

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# ONCOLOGY

**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** Effect of electromagnetic fields patients undergoing massive bone graft following bone tumor resection. A double-blind study.

**AUTHORS:** Capanna R; Donati D; Masetti C; Manfrini M; Panozzo A; Cadossi R; Campanacci M

**AUTHOR:** Istituto Ortopedico Rizzoli, Clinica Ortopedica I, Universita di Bologna, Italy.

**AFFILIATION:**

**SOURCE:** Clin Orthop 1994 Sep;(306):213-21

**CITATION IDS:** PMID: 8070199 UI: 94349691

**ABSTRACT:** Massive bone allograft after tumor resection has been used for over 20 years. Many factors negatively influence the healing of the junction between the allograft and the host bone, resulting in a low healing rate and lengthy time to union. This study evaluated whether pulsing electromagnetic field stimulation could be advantageously used in these patients. A double-blind prospective randomized study was designed. Eighty three host graft junctions in 47 patients were considered. The overall host graft junction healing rate was the same (67%) in both control and active stimulated patients. Although not statistically significant, a positive effect of pulsing electromagnetic fields was observed for those graft junctions with a cortico-cortical contact between allograft and host bone. When adjuvant postoperative chemotherapy was not employed, a definite effect of pulsing electromagnetic field stimulation was observed: the healing time decreased from 9.4 months in the control group to 6.7 months in the active stimulated group ( $p < 0.001$ ). This effect would have been lost if chemotherapy was employed. There was also no advantage in supplement with iliac crest autographs at the host graft junction site if chemotherapy was used. Factors that significantly influenced the host graft junction healing rate were: chemotherapy; type of allograft host bone contract; quality of host graft junction; and in intercalary allografts, use of the osteosynthesis device. No difference was observed between control and active groups for patient survival or number of local or distal tumor recurrences.

**MAIN MESH HEADINGS:** \*Bone Transplantation  
Electric Stimulation Therapy/ \*methods  
\*Electromagnetic Fields  
Osscointegration/ \*radiation effects

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## National Library of Medicine: IGM Full Record Screen

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**TITLE:** Chemotherapy of human carcinoma xenografts during pulsed magnetic field exposure.

**AUTHORS:** Hannan CJ Jr; Liang Y; Allison JD; Pantazis CG; Searle JR

**AUTHOR:** Radiology Department, Medical College of Georgia, Augusta 30912.

**AFFILIATION:**

**SOURCE:** Anticancer Res 1994 Jul-Aug;14(4A):1521-4

**CITATION IDS:** PMID: 7979179 UI: 95069897

**ABSTRACT:** Immune deficient mice growing xenografts of IIT-29 or A-431 cell lines were treated with cisplatin, carboplatin or doxorubicin in combination with one hour of whole body pulsed magnetic field (PMF) exposure (calculated peak field 5.2 m Tesla, with an average field strength of 0.525m Teslarms; pulses rose for 120 microseconds and then abruptly fell to neutral, and were repeated at a rate of 250 pulses per second). At 24 days, the mice in each experiment were found to have significantly ( $p < 0.05$ , ANOVA) different tumor sizes among groups. The smallest mean tumor volume was consistently found in the drug+PMF group. With A-431 tumors, the cisplatin+PMF group (T) was significantly smaller, 52% [1-(100T/C)], than the cisplatin alone group (C). In IIT-29 tumors, those treated with carboplatin+PMF had the smallest tumor volume at just 34% of the carboplatin-alone group. In ITT-29 tumors, the doxorubicin+PMF group was 35% of the doxorubicin alone group.

**MAIN MESH HEADINGS:** Carboplatin/ \*therapeutic use  
Carcinoma, Squamous Cell/ \* drug therapy  
Cisplatin/ \*therapeutic use  
Colonic /Neoplasms/ \*drug therapy  
Doxorubicin/ \*therapeutic use  
\*Magnetics

**ADDITIONAL MESH HEADINGS:** Animal  
Carcinoma, Squamous Cell/ pathology  
Cell Line  
Colonic Neoplasms/ pathology  
Human  
Mice  
Mice, Nude  
Time Factors  
Transplantation, Heterologous  
Tumor Cells, Cultured  
1994/07  
1994/01 00:00

**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** Effects of 100 mT time varying magnetic fields on the growth of tumors in mice.

**AUTHORS:** de Seze R; Tuffet S; Moreau JM; Veyret B

**AUTHOR:** Laboratoire de Physique des Interactions Ondes-Matiere (PIOM),

**AFFILIATION:** ENSCPB, Universite Bordeaux I, Talence, France.

**SOURCE:** Bioelectromagnetics 2000 Feb;21(2):107-11

**CITATION IDS:** PMID: 10653621 UI: 20119137

**ABSTRACT:** The effects of 100-mT, 0.8-Hz square-wave magnetic fields on the growth of chemically induced tumors in mice were investigated. Tumors were initiated using one injection of benzo(a) pyrene (either 0.2 mg or 2.0 mg/animal). Male and female mice (Balb/c, C3H and C57/bl/6 strains) were exposed for 8h/day from the onset of tumor until death or until the tumor volume reached a predetermined volume. Statistically significant decrease in the rate of tumor growth and increase in survival were observed in all cases. Results are discussed in terms of previous published work and of possible mechanisms. Copyright 2000 Wiley-Liss, Inc.

**MAIN MESH HEADINGS:** \*Electromagnetic Fields

**ADDITIONAL MESH HEADINGS:** Neoplasms, Experimental/ \*pathology  
Animal  
Benzo(a) pyrene  
Cell Division/ radiation effects  
Female  
Male  
Mice  
Mice, Inbred BALB C  
Mice, Inbred C3H  
Mice, Inbred C57BL  
Neoplasms, Experimental/ chemically induced  
Neoplasms, Experimental/ therapy  
Sex Factors  
Species Specificity  
Support, Non-U.S. Gov't  
Time Factors  
2000/02  
2000/26 09:00

**PUBLICATION TYPES:** JOURNAL ARTICLE

**CAS REGISTRY NUMBERS:** 50-32-8 (Benzo(a) pyrene)

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Pump, P-glycoprotein. Further work to determine conditions for maximum modulation of drug potency by PMFs is warranted.

**MAIN MESH** Daunorubicin/ \*toxicity

**HEADINGS:** Dug Resistance, Multiple/ \*radiation effects

**ADDITIONAL MESH HEADINGS:** \*Magnetics

Animal

Clone Cells

Combined Modality Therapy

Daunorubicin / therapeutic use

Female

Human

KB Cells

Magnetics/ therapeutic use

Mice

Mice, Nude

Nasopharyngeal Neoplasms/ drug therapy

Nasopharyngeal Neoplasms/ radiotherapy

Support, Non-U.S. Gov't

Support U.S. Gov't, Non-P.H.S.

Transplantation, Heterologous

1997/05

1997/01 00:00

**PUBLICATION TYPES:** JOURNAL ARTICLE

**CAS REGISTRY NUMBERS:** 20830-81-3 (Daunorubicin)

**LANGUAGES:** Eng

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# Neurology

# Neurosurgery

**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** Freezing of gait in Parkinson's disease is improved by treatment with weak electromagnetic fields.

**AUTHORS:** Sandyk R

**AUTHOR:** NeuroCommunication Research Laboratories, Danbury, CT 06811, USA.

**AFFILIATION:**

**SOURCE:** Int J Neurosci 1996 Mar;85(1-2):111-24

**CITATION IDS:** PMID: 8727687 UI: 96328736

**ABSTRACT:** Freezing , a symptom characterized by difficulty in the initiation and smooth pursuit of repetitive movements, is a unique and well known clinical feature of Parkinson's disease (PD). It usually occurs in patients with long duration and advanced stage of the disease and is a major cause of disability often resulting in falling. In PD patients freezing manifests most commonly as a sudden attack of immobility usually experienced during walking, attempts to turn while walking, or while approaching a destination. Less commonly it is expressed as arrest of speech or handwriting. The pathophysiology of parkinsonian freezing, which is considered a distinct clinical feature independent of akinesia, is poorly understood and is believed to involve abnormalities in dopamine and norepinephrine neurotransmission in critical motor control areas including the frontal lobe, basal ganglia, locus coeruleus and spinal cord. In general, freezing is resistant to pharmacological therapy although in some patients reduction or increase in levodopa dose may improve this symptom. Three medicated PD patients exhibiting disabling episodes of freezing of gait are presented in whom brief, extracerebral applications of pulsed electromagnetic fields (EMFs) in the picotesla range improved freezing. Two patients had freezing both during "on" and "off" periods while the third patient experienced random episodes freezing throughout the course of the day. The effect of each EMFs treatment lasted several days after which time freezing gradually reappeared, initially in association with "off" periods. These findings suggests that the neurochemical mechanisms underlying the development of freezing are sensitive to the effects of EMFs, which are believed to improve freezing primarily through the facilitation of serotonin (5-HT) neurotransmission at both junctional (synaptic) and nonjunctional neuronal target sites.

**MAIN MESH HEADINGS:** \*Electromagnetic Fields  
Gait/ \*radiation effects  
Parkinson Disease/ \*therapy

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**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** Reversal of a body image disorder (macrosomatognosia) in Parkinson's disease by treatment with AC pulsed electromagnetic fields.

**AUTHORS:** Sandyk R

**AUTHOR:** Department of Neuroscience, Institute for Biomedical Engineering and Rehabilitation Services of Touro College, Dix Hills, NY 11746, USA.

**AFFILIATION:**

**SOURCE:** Int J Neurosci 1998 Feb;93(1-2):43-54

**CITATION IDS:** PMID: 9604168 UI: 98267527

**ABSTRACT:** Macrosomatognosia refers to a disorder of the body image in which the patient perceives a part or parts of his body as disproportionately large. Macrosomatognosia has been associated with lesions in parietal lobe, particularly the right parietal which integrates perceptual-sensorimotor functions concerned with the body image. It has been observed most commonly in patients with paroxysmal cerebral disorders such as epilepsy and migraine. The Draw-a Person-Test has been employed in Neuropsychological testing to identify disorders of the body image. Three fully medicated elderly Parkinsonian patients who exhibited, on the Draw-a-Person Test, macrosomatognosia involving the upper limbs are presented. In these patients spontaneous drawing of the figure of a man demonstrated disproportionately large arms. Furthermore it was observed that the arm effected by tremor or, in the case of bilateral tremor, the arm showing the most severe tremor showed the greatest abnormality. This association implies that dopaminergic mechanisms influence neuronal systems in the nondominant right parietal lobe which construct the body image. After receiving a course of treatments with AC electromagnetic fields (EMFs) in the picotesla flux density applied transcranially these patients' drawings showed reversal of the macrosomatognosia. These findings demonstrate that transcranial applications of AC pulsed EMFs affect the neuronal systems involved in the construction of the human body image and additionally reversed disorders of the body image in Parkinsonism which are related to right parietal lobe dysfunction.

**MAIN MESH HEADINGS:** \*Body Image  
\*Electromagnetic Fields  
Parkinson Disease/ \*psychology  
Parkinson Disease/ \*therapy

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**ADDITIONAL  
MESH  
HEADINGS:** Analysis of Variance  
Animal  
Axons/ physiology  
Axons/ radiation effects  
Axons/ ultrastructure  
Culture Media  
Dyes/ diagnostic use  
Electromagnetics/ instrumentation  
Equipment Design  
Ganglia, Spinal/ embryology  
Histocytochemistry  
Nerve Growth Factor/ administration & dosage  
Nerve Regeneration/ radiation effects  
Neurites/ physiology  
Neurites/ ultrastructure  
Rats  
Rats, Sprague-Dawley  
Single-Blind Method  
Support, Non-U.S. Gov't  
Support, U.S. Gov't, Non-P.H.S.  
Support, U.S. Gov't, P.H.S.  
Time Factors  
Tissue Culture  
2000/07  
2000/06 11:00

**PUBLICATION  
TYPES:** JOURNAL ARTICLE

**CAS  
REGISTRY  
NUMBERS:** 0 (Culture Media)  
0 (Dyes)  
9061-61-4 (Nerve Growth Factor)

**LANGUAGES:** Eng

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**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** Weak electromagnetic fields reverse visuospatial hemi-inattention in Parkinson's disease.

**AUTHORS:** Sandyk R

**AUTHOR:** NeuroCommunication Research Laboratories, Danbury, CT 06811, USA.

**AFFILIATION:**

**SOURCE:** Int J Neurosci 1995 Mar;81(1-2):47-65

**CITATION IDS:** PMID: 7775072 UI: 95293542

**ABSTRACT:** Drawing tasks, both free and copied have achieved a central position in neuropsychological testing of patients with unilateral cerebral dysfunction by virtue of their sensitivity to different kinds of organic brain disorders and their ability to provide information on liberalized brain damage. In the drawings of patients with right hemispheric damage, visuospatial neglect is revealed by the omission of details on the side of the drawing contralateral to the hemispheric lesion. Patients with unilateral cerebral damage, particularly those with left hemispheric damage, also demonstrate a tendency to place their drawings on the side of the page ipsilateral to the cerebral lesion, a cerebral phenomenon which has been termed visuospatial hemi-inattention. It has been reported previously that brief external application of alternating pulsed electromagnetic fields (EMFs) in the picotesla (pT) range intensity improved visuoperceptive and visuospatial functions and reverse neglect in Parkinsonian patients. The present communication concerns four fully medicated elderly nondemented Parkinsonian patients (mean age: 74.7+/- 4.6yrs; mean duration of illness: 7.7 +/- 5.2 yrs) in whom application of these EMFs produced reversal of visuospatial hemi-inattention related to left hemispheric dysfunction. These findings support prior observations demonstrating that pT EMFs may bring about reversal of certain cognitive deficits in Parkinsonian patients.

**MAIN MESH HEADINGS:** \*Electromagnetics  
Parkinson Disease/ \*therapy  
\*Space Perception  
\*Visual Fields

**ADDITIONAL MESH HEADINGS:** Aged  
Brain/ physiopathology  
Case Report  
Cognition Disorders/ etiology  
Human  
Laterality  
Male  
Melatonin/ secretion

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# Gynecology

**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** Analgesic properties of electromagnetic field therapy in patients with chronic pelvic pain.

**AUTHORS:** Varcaccio-Garofalo G; Carriero C; Loizzo MR; Amoruso S; Loizzi P

**AUTHOR:** Institute of Obstetrics and Gynecology II Clinic, University of Bari, Italy.

**AFFILIATION:**

**SOURCE:** Clin Exp Obstet Gynecol 1995;22(4):350-4

**CITATION IDS:** PMID: 8777794 UI: 96114165

**ABSTRACT:** AIM: Demonstration of analgesic effects of electromagnetic field treatment in cases of chronic refractory pelvic pain. **STUDY DESIGN:** Prospective non-controlled trial, 64 women complaining about pelvic pain of at least 6 months duration, resistant to standard therapies, submitted to electromagnetic field applications on both iliac regions by Thelf system apparatus by two applications daily lasting 2 hours each for 20-40 days. Control visit after 3 months. **RESULTS:** Complete subsidence of pain in 39 cases (61%), in 15 patients (23%) relief during treatment, then mild endopelvic tension after 3-month control; in 10 cases (16%) symptoms reduced only during application hours, unchanged at follow-up. Outcome of treatment appears to be independent of pre-existent psychosocial variables. **CONCLUSION:** Magnetic therapy shows a real analgesic effect on pelvic pain, and seems to contribute to resolution of complex interactions between somatic nociceptive stimuli and psychosocial implications affecting pain perception in these patients.

**MAIN MESH HEADINGS:** \*Analgesia

**ADDITIONAL MESH HEADINGS:** \*Electromagnetic Fields  
Adult  
Female  
Human  
Middle Age  
Pelvic Pain  
Prospective Studies  
1995/01  
1995/01 00:00

**PUBLICATION TYPES:** CLINICAL TRIAL  
JOURNAL ARTICLE

**LANGUAGES:** Eng

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## National Library of Medicine: IGM Full Record Screen

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**TITLE:** Electrochemical therapy of pelvic pain: effects of pulsed electromagnetic fields (PEMF) on tissue trauma.

**AUTHORS:** Jorgensen WA; Frome BM; Wallach C

**AUTHOR:** International Pain Research Institute, Los Angeles, California.

**AFFILIATION:**

**SOURCE:** Eur J Surg Suppl 1994;(574):83-6

**CITATION IDS:** PMID: 7531030 UI: 95143572

**ABSTRACTS:** Unusually effective and long-lasting relief of pelvic pain of gynaecological origin has been obtained consistently by short exposures of affected areas to the application of a magnetic induction device producing short, sharp, magnetic-field pulses of a minimal amplitude to initiate the electrochemical phenomenon of electroporation within a 25 cm<sup>2</sup> focal area. Treatments are short, fast-acting, economical and in many instances have obviated surgery. This report describes typical cases such as dysmenorrhoea, endometriosis, ruptured ovarian cyst, acute lower urinary tract infection, post-operative haematoma, and persistent dyspareunia in which pulsed magnetic field treatment has not, in most cases, been supplemented by analgesic medication. Of 17 female patients presenting with a total of 20 episodes of pelvic pain, of which 11 episodes were acute, seven chronic and two acute as well as chronic, 16 patients representing 18 episodes (90%) experienced marked, even dramatic relief, while two patients representing two episodes reported less than complete pain relief.

**MAIN MESH HEADINGS:** Electric Stimulation Therapy/ \*methods  
\*Electromagnetic Fields  
Pelvic Pain/ \*therapy

**ADDITIONAL MESH HEADINGS:** Acute Disease  
Adult  
Chronic Diseases  
Electrochemistry  
Female  
Genital diseases, Female/ complications  
Human  
Middle Age  
Pelvic Pain/ etiology  
Pulsatile Flow  
Treatment Outcome  
1994/01  
1994/01 00:00

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# **Bone metabolism**

## **Osteoporosis**

**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** The effect of pulsed electromagnetic fields on osteoporosis at the knee in individuals with spinal cord injury.

**AUTHORS:** Garland DE; Adkins RH; Matsuno NN; Stewart CA

**AUTHOR:** Rancho Los Amigos Medical Center, Downey, California 90242,

**AFFILIATION:** USA.

**SOURCE:** J Spinal Cord Med 1999 Winter;22(4):239-45

**CITATION IDS:** PMID: 10751127 UI: 20213179

**ABSTRACT:** The purpose of this study was to determine the effects of pulsed electromagnetic fields on osteoporotic bone at the knee in individuals with chronic spinal injury. The study consisted of 6 males with complete spinal cord injury at a minimum of 2 years duration. Bone mineral density (BMD) was obtained at both knees at initiation, 3 months, 6 months, and 12 months using dual energy X-ray absorptiometry. In each case, 1 knee was stimulated using The Bone Growth Stimulator Model 3005 from American Medical Electronics, Incorporated and the opposite knee served as the control. Stimulation ceased at 6 months. At 3 months BMD increased in the stimulated knees 5.1% and declined in the control knees 6.6% ( $p < .05$  and  $p < .02$ , respectively). By 6 months the BMD returned to near baseline values and at 12 months both knees had lost bone at a similar rate to 2.4% below baseline for the control. There were larger effects closer to the site of stimulation. While the stimulation appeared useful in retarding osteoporosis, the unexpected exaggerated decline in the control knees and reversal at 6 months suggests underlying mechanisms are more complex than originally anticipated. The authors believe a local as well as a systemic response was created.

**MAIN MESH HEADINGS:** \*Electromagnetic Fields  
\*Knee  
Osteoporosis/ \*therapy  
Spinal Cord Injuries/ \*complications  
Adult

**ADDITIONAL MESH HEADINGS:** Bone Density/ physiology  
Densitometry, X-Ray  
Human  
Male  
Osteoporosis/ physiopathology  
Support, U.S. Gov't, No-P.H.S.  
Support, U.S. Gov't. P.H.S.

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**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** Electromagnetic Fields in the treatment of postmenopausal osteoporosis: an experimental study conducted by densitometric, dry ash weight and metabolic analysis of bone tissue.

**AUTHORS:** Bilotta TW; Zati A; Gnudi S; Figus E; Giardino R; Fini M; Pratelli L; Mongiorgi R

**AUTHOR:** Servizio di Recupero e Rieducazione Funzionale, Istituto Rizzoli,

**AFFILIATION:** Bologna.

**SOURCE:** Chir Organi Mov 1994 Jul-Sept;79(3):309-13

**CITATION IDS:** PMID: 7842842 UI: 95145123

**ABSTRACT:** The authors conducted an experimental study on 32 female rats which had been castrated at 10 months of age in order to verify the ability of pulsating electromagnetic fields to prevent osteoporosis induced by surgical menopause. Two different values of intensity of PEMFs were used: 30 G and 70 G. After 4 months of treatment the following testing was done: monophotonic bone densitometry of the lumbar spine, quantitative measurement of the dry ash weight of the femurs, and hematochemical tests to evaluate bone metabolism. The experimental study showed that the PEMFs supplied at 30 Gauss were capable of slowing down the loss of bone mass, while the PEMFs supplied at 70 Gauss obstructed bone decay, providing values for Bone Mineral Density and dry ash weight which were similar to those observed in the non-castrated control group. Hematochemical tests did not reveal significant variations between the two groups.

**MAIN MESH HEADINGS:** Bone and Bones/ \*radiation effects  
Bone Density/ \*radiation effects  
\*Electromagnetic Fields  
Osteoporosis, Postmenopausal/ \*radiotherapy

**ADDITIONAL MESH HEADINGS:** Animal  
Bone and Bones/ chemistry  
Bone and Bones/ metabolism  
Comparative Study  
Disease Models, Animal  
Dose-Response Relationship, Radiation  
Female  
Human  
Osteoporosis, Postmenopausal/ metabolism  
Ovariectomy  
Rats  
Rats, Sprague-Dawley  
1994/07

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**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** Bone density changes in osteoporosis-prone women exposed to pulsed electromagnetic fields (PEMFs).

**AUTHORS:** Tabrah F; Hoffmeier M; Gilbert F Jr; Batkin S; Bassett CA

**AUTHOR:** University of Hawaii School of Medicine, Straub Clinic and Hospital, Honolulu.

**AFFILIATION:**

**SOURCE:** J Bone Miner Res 1990 May;5(5):437-42

**CITATION IDS:** PMID: 2195843 UI: 90313511

**ABSTRACT:** To determine the effect of a 72 Hz pulsating electromagnetic field (PEMF) on bone density of the radii of osteoporosis-prone women, the nondominant forearms of 20 subjects were exposed to PEMF 10 h daily for a period of 12 weeks. Bone density before, during and after the exposure period was determined by use of a Norland-Cameron bone mineral analyzer. Bone mineral densities of the treated radii measured by single-photon densitometry increased significantly in the immediate area of the field during the exposure period and decreased during the following 36 weeks. A similar but weaker response occurred in the opposite arm, suggesting a "cross-talk" effect on the nontreated radii, from either possible arm proximity during sleep or very weak general field effects. The data suggest that properly applied PEMFs, if scaled for whole-body use, may have clinical application in the prevention and treatment of osteoporosis.

**MAIN MESH HEADINGS:** \*Bone Density  
\*Electromagnetic Fields  
\*Electromagnetics  
Osteoporosis/ \*prevention & control

**ADDITIONAL MESH HEADINGS:** Aged  
Clinical Trial  
Female  
Human  
Middle Age  
Osteoporosis/ therapy  
Time Factors  
1990/05  
1990/01 00:00

**PUBLICATION TYPES:** CLINICAL TRIAL  
JOURNAL ARTICLE

**LANGUAGES:** Eng

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## National Library of Medicine: IGM Full Record Screen

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**TITLE:** Effects of electromagnetic stimulation on the functional responsiveness of isolated rat osteoclasts.

**AUTHORS:** Shankar VS; Simon BJ; Bax CM; Pazianas M; Moonga BS; Adebajo OA; Zaidi M

**AUTHOR:** Center for Osteoporosis and Skeletal Aging, Philadelphia VA

**AFFILIATION:** Medical Center, Pennsylvania 19104, USA.

**SOURCE:** J Cell Physiol 1998 Sep;176(3):537-44

**CITATION IDS:** PMID: 9699506 UI: 98363086

**ABSTRACT:** We report the effects of pulsed electromagnetic fields (PEMFs) on the responsiveness of osteoclasts to cellular, hormonal and ionic signals. Osteoclasts isolated from neonatal rat long bones were dispersed onto either slices of devitalized cortical bone (for the measurement of resorptive activity) or glass coverslips (for the determination of the cytosolic free  $Ca^{2+}$  concentration.  $[Ca^{2+}]_i$ ). Osteoclasts were also cocultured on bone with osteoblastlike, UMR-106 cells. Bone resorption was quantitated by scanning electronmicroscopy and computer-assisted morphometry. PEMF application to osteoblast-osteoclast cocultures for 18 hr resulted in a two fold stimulation of bone resorption. In contrast, resorption by isolated osteoclasts remained unchanged in the presence of PEMFs, suggesting that osteoblasts were necessary for the PEMF induced resorption stimulation seen in osteoblast-osteoclast cocultures. Furthermore, the potent inhibitory action of the hormone calcitonin on bone resorption was unaffected by PEMF application. However, PEMFs completely reversed another quite distinct action of calcitonin on the osteoclast: its potent inhibitory effect on the activation of the divalent cation-sensing (or  $Ca^{2+}$ ) receptor. For these experiments, we made fura 2-based measurements of cytosolic  $\{Ca^{2+}\}_i$  in single osteoclasts in response to the application of a known  $Ca^{2+}$  receptor agonist,  $Ni^{2+}$ . We first confirmed that activation of the osteoclast  $Ca^{2+}$  receptor by  $Ni^{2+}$  (5mM) resulted in a characteristic monophasic elevation of cytosolic  $\{Ca^{2+}\}_i$ . As shown previously, this response was attenuated strongly by calcitonin at concentrations between 0.03 and 3nM but remained intact in response to PEMFs. PEMF application, however, prevented the inhibitory effect of calcitonin on  $Ni^{2+}$  induced cytosolic  $Ca^{2+}$  elevation. This suggested that the fields disrupted the interaction between the calcitonin and  $Ca^{2+}$  receptor systems. In conclusion, we have shown that electromagnetic fields stimulate bone resorption through an action on the osteoblast and, by abolishing the inhibitory effects of calcitonin, also restore the

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**MAIN MESH HEADINGS:** responsiveness of osteoclasts to divalent cations.  
Bone Resorption/ \*physiopathology

\*Electromagnetic Fields  
Femur/ \*cytology  
Osteoclasts/ \*physiology  
Tibia/ \*cytology  
Animal

**ADDITIONAL MESH HEADINGS:**

Animals, Newborn  
Calcitonin/ pharmacology  
Calcium/ metabolism  
Calcium- Binding Proteins/ physiology  
Cells, Cultured  
Electric Stimulation  
Electrophysiology  
Nickel/ pharmacology  
Osteoclasts/ cytology  
Osteoclasts/ drug effects  
Parathyroid Hormones/ pharmacology  
Rats  
Rats/ Wistar  
Support, Non-U.S. Gov't  
Support, U.S. Gov't, Non-P.H.S.  
Support, U.S. Gov't, P.H.S.  
Tumor Necrosis Factor / pharmacology  
2000/06  
2000/20 09:00

**PUBLICATION TYPES:**

JOURNAL PRACTICE

**CAS REGISTRY NUMBERS:**

0 (Calcium-Binding Proteins)  
0 ( Parathyroid Hormones)  
0 (Tumor Necrosis Factor)  
7440-02-0 (Nickel)  
7440-70-2 (Calcium)  
9007-12-9 (Calcitonin)

**LANGUAGES:**

Eng

**GRANT/**

RO1 AG14917-01/AG/NIA

**CONTRACT ID:**

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**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** Osteogenesis by pulsing electromagnetic fields (PEMFs): optimum stimulation setting.

**AUTHORS:** Matsunaga S; Sakou T; Ijiri K

**AUTHOR:** Department of Orthopaedic Surgery, Faculty of Medicine, Kagoshima University of Japan.

**AFFILIATION:** University of Japan.

**SOURCE:** In Vivo 1996 May-Jun;10(3):351-6

**CITATION IDS:** PMID: 8797039 UI: 96389945

**ABSTRACT:** The optimum setting for electromagnetic stimulation was examined by histologically assessing the degree of osteogenesis at different settings of electromagnetic stimulation, and comparing alkaline phosphatase (ALP) activity in the bone marrow. For this experiment, an electromagnetic field generator manufactured by the Institute of Physical and Chemical Research was used. The intensity of the magnetic field was set at eight levels; 0.1, 0.2, 0.4, 1, 2, 4, 6 and 8 gauss (G). The frequencies used were 5, 10, 20, 50, 100 and 200 Hz. Pulse durations were 6, 12, 25, 50 and 100 micro sec. Significant ALP elevation and osteogenesis were observed at magnetic field intensities of 0.4, 1, and 2G. ALP activity did not differ between different frequencies. ALP activity at pulse durations of 25 and 50 micro see were significantly higher than at the other pulse durations. The effect of electromagnetic stimulation on osteogenesis greatly depends on the intensity and pulse duration of the stimulation.

**MAIN MESH HEADINGS:** Alkaline Phosphatase/ \*analysis  
Bone Marrow/ \*enzymology  
\*Electromagnetic Fields  
Osteogenesis/ \*physiology

**ADDITIONAL MESH HEADINGS:** Animal  
Bone Development/ physiology  
Histocytochemistry  
Rabbits  
1996/05  
1996/01 00:00

**PUBLICATION TYPES:** JOURNAL ARTICLE

**CAS REGISTRY NUMBERS:** EC 3.1.3.1 (Alkaline Phosphatase)

**LANGUAGES:** Eng

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**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** Pulsed electromagnetic fields simultaneously induce osteogenesis and upregulate transcription of bone morphogenetic proteins 2 and 4 in rat osteoblasts in vitro.

**AUTHORS:** Bodamyali T; Bhatt B; Hughes FJ; Winrow VR; Kanezler JM; Simon B; Abbot J; Blake DR; Stevens CR

**AUTHOR:** School of Postgraduate Medicine, University of Bath, Claverton Down, United Kingdom.

**AFFILIATION:**

**SOURCE:** Biochem Biophys Res Commun 1998 Sep 18; 250(2):458-61

**CITATION IDS:** PMID: 9753652 UI: 98440820

**ABSTRACT:** Pulsed electromagnetic fields (PEMF) are successfully employed in the treatment of a variety of orthopaedic conditions, particularly delayed and nonunion fractures. In this study, we examined PEMF effects on in vitro osteogenesis by bone nodule formation and on mRNA expression of bone morphogenetic proteins 2 and 4 by reverse-transcriptase polymerase chain reaction (RT-PCR) in cultured rat calvarial osteoblasts. PEMF exposure induced a significant increase in both the number (39% over unexposed controls) and size (70% larger compared to unexposed controls) of bone-like nodules formed. PEMF also induced an increase in the levels of BMP-2 and BMP-4 mRNA in comparison to controls. This effect was directly related to the duration of PEMF exposure. This study shows that clinically applied PEMF have a reproducible osteogenic effect in vitro and simultaneously induce BMP-2 and -4 mRNA transcription. This supports the concept that the two effects are related.

**MAIN MESH HEADINGS:** Bone Morphogenetic proteins/ \*genetics  
\*Electromagnetic Fields  
\*Osteoblasts  
Trans-Activation (Genetics)/ \*radiation effects

**ADDITIONAL MESH HEADINGS:** Animal  
Bone Morphogenetic Proteins/ biosynthesis  
Cell Differentiation/ radiation effects  
Morphogenesis/ radiation effects  
Osteoblasts/ cytology  
Osteoblasts/ physiology  
Osteoblasts/ radiation effects  
Rats  
Skull  
Support, Non-U.S. Gov't  
1998/10  
1998/01 02:01

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**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** Prevention of osteoporosis by pulsed electromagnetic fields.  
**AUTHORS:** Rubin CT; McLeod KJ; Lanyon LE  
**AUTHOR:** Musculo-Skeletal Research Laboratory, Department of Orthopaedics,  
**AFFILIATION:** State University of New York, Stony Brook 11794.  
**SOURCE:** J Bone Joint Surg {Am} 1989 Mar;71(3):411-7  
**CITATION IDS:** PMID: 2925715 UI: 89174865  
**ABSTRACT:** Using an animal model, we examined the use of pulsed electromagnetic fields, induced at a physiological frequency and intensity, to prevent the osteoporosis that is concomitant with disuse. By protecting the left ulnae of turkeys from functional loading, we noted a loss of bone of 13.0 per cent compared with the intact contralateral control ulnae over an eight-week experimental period. Using a treatment regimen of one hour per day of pulsed electromagnetic fields, we observed an osteogenic dose-response to induced electrical power, with a maximum osteogenic effect between 0.01 and 0.04 tesla per second. Pulse power levels of more or less than these levels were less effective. The maximum osteogenic response was obtained by a decrease in the level of intracortical remodeling, inhibition of endosteal resorption, and stimulation of both periosteal and endosteal new-bone formation. These data suggest that short daily periods of exposure to appropriate electromagnetic fields can beneficially influence the behavior of the cell populations that are responsible for bone-remodeling, and that there is an effective window of induced electrical power in which bone mass can be controlled in the absence of mechanical loading.

**MAIN MESH HEADINGS:** Electromagnetic Fields/ \*therapeutic use  
Electromagnetics/ \*therapeutic use  
Osteoporosis/ \*prevention & control

**ADDITIONAL MESH HEADINGS:** Animal  
Comparative Study  
Disease Models, Animal  
Male  
Osteogenesis  
Osteotomy  
Support, Non-U.S. Gov't  
Support, U.S. Gov't, Non-P.H.S.  
Time Factors  
Turkeys  
Ulna/ surgery  
1989/03  
1989/01 00:00

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# Ophthalmology

## National Library of Medicine: IGM Full Record Screen

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**TITLE:** [The effect of a pulsed electromagnetic field on the hemodynamics of eyes with glaucoma]

**VERNACULAR TITLE:** Vliianie impul'snogo elektromagnitnogo polia na gemodinamiku glaukomnogo glaza.

**AUTHORS:** Tsisel'skii IuV; Kashintseva LT; Skrinnik AV

**SOURCE:** Oftalmol Zh 1990;(3):154-7

**CITATION IDS:** PMID: 2255478 UI: 91074480

**ABSTRACT:** The influence of pulsed electromagnetic field (PEMF) on hemodynamics of the eye in open-angle glaucoma has been studied by means of a method and a device proposed at the Filatov Institute. The PEMF characteristics are: impulse frequency-50 Hz, exposition-0.02 sec, impulse shape-square, rate of impulse rise-4.10(4) c rate of magnetic induction rise-2.10(4) mT/c, amplitude value of magnetic induction at the impulse height-9.0-8.5 mT, duration of the procedure-7 min, a course-10 sessions. Observations over 150 patients (283 eyes) with latent, initial and advanced glaucoma have shown a positive influence of PEMF on hemodynamics of a glaucomatous eye; a rise rheographic coefficient and relative volume pulse in 87,99 and 81,63%, respectively. The degree of the rise and restoration frequency of rheographic values of the glaucomatous eye under the influence of PEMF to the age norm was more expressed at initial stages of the glaucomatous process (latent and initial glaucoma).

**MAIN MESH HEADINGS:** \*Electromagnetic Fields  
Eye/ \*physiopathology  
Glaucoma, Open-Angle/ \*therapy

**ADDITIONAL MESH HEADINGS:** Aged  
Comparative Study  
English Abstract  
Evaluation Studies  
Glaucoma, Open-Angle/ physiopathology  
Hemodynamics/ physiology  
Human  
Middle Age  
Ocular Hypertension/ physiopathology  
Ocular Hypertension/ therapy  
1990/01  
1990/01 00:00

**PUBLICATION TYPES:** JOURNAL ARTICLE

**LANGUAGES:** Eng

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**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** [The effect of pulsed electromagnetic field on ocular hydrodynamics in open-angle glaucoma]

**VERNACULAR TITLE:** Vliianie impul'snogo elektromagnitnogo polia na gidrodinamiku glaza pri otkrytougol'noi glaukome.

**AUTHORS:** Tsisel'skii IuV

**SOURCE:** Oftalmol Zh 1990;(2):89-92

**CITATION IDS:** PMID: 2280950 UI: 91125806

**ABSTRACT:** The influence of pulse electromagnetic field on the hydrodynamics of the eye in open-angle glaucoma has been studied using the method and the device suggested at the Filatov Institute. The characteristics of the action were: impulse frequency-50 Hz, duration-0.2 sec, pulse form-rectangular, rate of pulse rise-4/10(-4) sec, rate of magnetic induction rise-2/10(-4) mT/sec, amplitude value of magnetic induction at the pulse level 8.0 - 8.5 mT, duration of the procedure-7 min. Ten session in a total. Observations over 150 patients (283 eyes) with latent, initial and advanced glaucoma have shown that the usage of pulse electromagnetic field exerts influence on the hydrodynamics of the eye in open-angle glaucoma; stimulates the rise of aqueous outflow and production, the reduction of the Becker's coefficient. At the latent of the disease, normalization of outflow was recorded in 25% of cases, at the initial and advanced stages-in 17.8% and 16.0% of cases, respectively. The investigations carried out allow to recommend the mentioned method for a complex treatment of open-angle glaucoma.

**MAIN MESH HEADINGS:** \*Electromagnetic Fields  
Glaucoma, Open-Angle/ \*therapy  
\*Intraocular Pressure

**ADDITIONAL MESH HEADINGS:** Aged  
Comparative Study  
English Abstract  
Evaluation Studies  
Glaucoma, Open-Angle/ physiopathology  
Human  
Middle Age  
1990/01  
1990/01 00:00

**PUBLICATION TYPES:** JOURNAL ARTICLE

**LANGUAGES:** Rus

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**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** [The impulse electromagnetic field in the treatment of dystrophic lesions of the retina]

**VERNACULAR TITLE:** Impul'snoe elektromagnitnoe pole v lechenii distroficheskikh porazhenii setchatoi obolochki glaza.

**AUTHORS:** Skrinnik AV; Koval'chuk AS

**SOURCE:** Oftamal Zh 1989;(8):459-62

**CITATION IDS:** PMID: 263344 UI: 90259463

**ABSTRACT:** The paper describes a new method proposed for treatment of dystrophic changes in the retina by means of impulse electromagnetic field and a device for its realization. It was used as an independent method of treatment in 283 eyes (177 patients) with macular dystrophics of a sclerotic genesis. The treatment has shown a positive influence on the pathologic process in the eye, its stabilization after treatment. In 152 eyes, visual acuity remained unchanged, in 131-improved. Stabilization of the process was accompanied by authentic improvement of rheographic and electrophysiologic indices. In 72 eyes, the results of treatment were followed up for 6 years, the effectiveness of the method was confirmed. Long-term observations have shown the necessity to repeat the course of treatment each 3-5 months (within a year) to prevent progression of the dystrophic process.

**MAIN MESH HEADINGS:** \*Electromagnetic Fields  
\*Electromagnetics  
Retinal Degeneration/ \*therapy

**ADDITIONAL MESH HEADINGS:** Adult  
Chronic Disease  
Comparative Study  
Electroretinography  
English Abstract  
Follow-Up studies  
Human  
Methods  
Middle Age  
Posture  
Retinal Degeneration/ physiopathology  
Visual Acuity  
Visual Fields  
1989/01  
1989/01 00:00

**PUBLICATION TYPES:** JOURNAL ARTICLE

## National Library of Medicine: IGM Full Record Screen

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**TITLE:** The effect of pulsed electromagnetic field on patients with endocrine ophthalmopathy.

**AUTHORS:** Jankauskiene J; Paunksnis A; Bluziene A; Saulgozis J

**AUTHOR:** Department of Ophtalmology, Kaunas Medical Academy, Lithuania.

**AFFILIATION:**

**SOURCE:** Eur Ophtalmol 1998 Oct-Dec;8(4):253-7

**CITATION IDS:** PMID: 9891898 UI: 99109047

**ABSTRACT:** **PURPOSE:** To evaluate eye signs, proptosis and ocular movements in patients with endocrine ophtalmopathy under the influence of pulsed electromagnetic field therapy. **METHODS:** We examined 14 patients (9 women, 5 men) with endocrine ophtalmopathy and evaluated eye signs, proptosis and ocular movements before and after the course of pulsed electromagnetic field therapy, and 12 controls. Their age ranged from 29 to 57 years. Visual sensitivity was investigated with a static automatic perimeter (Allergan Humphrey Field Analyzer). The score was calculated by rating the severity of involvement of soft tissue proptosis, extraocular movements, corneal state and optic nerve function on a scale from 0 to 3. Th pulsed electromagnetic field procedures were carried out with the help of electromagnetic spectacles. **RESULTS:** Pulsed electromagnetic field therapy reduced the score for soft tissue and proptosis in patients who suffered from endocrine ophtalmopathy. There was fall in the mean score for ocular movements, corneal and optic nerve function but it did not reach significance after treatment. Electromagnetic field therapy has no useful effect on visual signs and eye movements in two patients who had had the illness more than two years. **CONCLUSIONS:** Localised pulsed electromagnetic field procedures can be recommended, together with other methods of conservation treatment of endocrine ophtalmopathy.

**MAIN MESH HEADINGS:** \*Electromagnetic Fields

**ADDITIONAL MESH HEADINGS:** Graves' Disease/ \*therapy  
Adult  
Comparative Study  
Exophtalmos/ diagnosis  
Exophtalmos/ physiopathology  
Exophtalmos/ therapy  
Eye Movements/ physiology  
Female  
Follow-Up Studies  
Graves' Disease/ diagnosis  
Graves' Disease/ physiopathology

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**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** Electromagnetic stimulation as a treatment of tinnitus: a pilot study.  
**AUTHORS:** Roland NJ; Hughes JB; Daley MB; Cook JA; Jones AS; McCormick MS  
**AUTHOR:** Department of Otolaryngology, Royal Liverpool University Hospital,  
**AFFILIATION:** UK.  
**SOURCE:** Clin Otolaryngol 1993 Aug;18(4) :278-81  
**CITATION IDS:** PMID: 8877185 UI: 97031260  
**ABSTRACT:** This paper reports the results of a study to determine whether pulsed electromagnetic stimulation, applied over the mastoid bone, caused an improvement in the level of tinnitus in long-standing tinnitus sufferers. Fifty-eight patients from the Liverpool Tinnitus Association volunteered to take part in a double-blind placebo controlled trial. Active and placebo devices were randomly allocated to these patients on their first visit. At the end of one week of treatment, each patient noted whether their tinnitus had completely disappeared, was improved, unchanged or made worse by the treatment. Forty-five per cent of the patients who completed the trial were improved by the active device, but only 9% by placebo (P=0.0013, Mann-Whitney test). We suggest that electromagnetic stimulation may be an effective treatment in some tinnitus sufferers.

**MAIN MESH HEADINGS:** \*Electromagnetic Fields  
**ADDITIONAL MESH HEADINGS:** Tinnitus/ \* therapy  
Adult  
Aged  
Aged 80, and over  
Double-blind Method  
Human  
Middle Age  
Pilot projects  
1993/08  
1993/01 00:00

**PUBLICATION TYPES:** CLINICAL TRIAL  
JOURNAL ARTICLE  
RANDOMIZED CONTROLLED TRIAL

**LANGUAGES:** Eng

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**National Library of Medicine: IGM Full Results Screen**

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**Citations 1 to 5 of 5 from MEDLINE**

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***Full Citation and Related Articles***

**TITLE:** [Use of an alternating magnetic field in the combined treatment of acute keratoconus.  
**AUTHORS:** Vainshtein ES, Kivaev AA, Babich GA, Zobina LV, Abugova TD  
**SOURCE:** Vestn Oftalmol. 1984 Sep-Oct;(5):44-6. Russian. No abstract available.  
**CIT. IDS:** PMID: 6495484 UI: 85041732

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**TITLE:** [experience in the use of an alternating magnetic field for treatment of edematous exophthalmos].  
**AUTHORS:** Vainshtein Es, Zobina LV, Kruzhkova GV, Mezentseva GA  
**SOURCE:** Vestn Oftalmol. 1983 Sep-Oct;(5):63-5. Russian. No abstract available.  
**CIT. IDS:** PMID: 6649262 UI: 84074671

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**TITLE:** [Alternating magnetic field in the treatment of various eye diseases of vascular etiology].  
**AUTHORS:** Vainshtein ES, Zobina LV, Gurtovaia EE  
**SOURCE:** Oftalmol Zh. 1981;36(6):325-8. Russian. No abstract available.  
**CIT. IDS:** PMID: 7312261 UI: 82081266

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**TITLE:** [Use of an alternating magnetic field in treating herpetic eye disease].  
**AUTHORS:** Vainshtein Es, Zobina LV, Larine LA  
**SOURCE:** Optimal Zh. 1980;35(5):278-81. Russian. No abstract available.  
**CIT. IDS:** PMID: 7422214 UI: 81031502

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**TITLE:** [Effect of an alternating magnetic field on the healing of experimental penetrating wounds of the cornea].  
**AUTHORS:** Lutsker LS, Vainshtein ES, Dubrovina MS  
**SOURCE:** Vestn Oftalmol. 1978 Jul-Aug;(4):67-9. Russian. No abstract available.  
**CIT. IDS:**

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# Summary Therapy Safety

## National Library of Medicine: IGM Full Record Screen

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**TITLE:** Directed and enhanced neurite growth with pulsed magnetic field stimulation

**AUTHORS:** Macias MY; Battocletti JH; Sutton CH; Pintar FA; Mailman DJ

**AUTHOR:** Department of Neurosurgery Medical College of Wisconsin, Milwaukee, WI, USA.

**AFFILIATION:** WI, USA.

**SOURCE:** Bioelectromagnetics 2000 May;21(4):272-86

**CITATION** PMID: 1079456 UI: 20259279

**IDS:**

**ABSTRACT:** Pulsed magnetic field (PMF) stimulation was applied to mammalian neurons in vitro to influence axonal growth and to determine whether induced current would direct and enhance neurite growth in the direction of the current. Two coils were constructed from individual sheets of copper folded into a square coil. Each coil was placed in a separate water-jacketed incubator. One was energized by a waveform generator driving a power amplifier, the other was not energized. Whole dorsal root ganglia (DRG) explant cultures from 15-day Sprague-Dawley rat embryos were established in supplemented media plus nerve growth factor (NGF) at concentrations of 0 -100 ng/ mL on a collagen-laminin substrate. Dishes were placed at the center of the top and bottom of both coils, so that the DRG were adjacent to the current flowing in the coil. After an initial 12 h allowing DRG attachment to the substrate floor, one coil was energized for 18 h, followed by a postexposure period of 18 h. Total incubation time was 48 h for all DRG cultures. At termination, DRG were histochemically stained for visualization and quantitative analysis of neurite outgrowth. Direction and length of neurite outgrowth were recorded with respect to direction of the current. PMF exposed DRG exhibited asymmetrical growth parallel to the current direction with concomitant enhancement of neurite length. DRG cultures not PMF exposed had a characteristic radial pattern of neurite outgrowth. These results suggest that PMF may offer a noninvasive mechanism to direct and promote nerve regeneration.

**MAIN MESH** \*Electromagnetic Fields

**HEADINGS:** Ganglia, Spinal/ \*radiation effects  
Neurites/ \*radiation effects

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**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** Intramembrane protein distribution in cell cultures is affected by 50 Hz pulsed magnetic field.

**AUTHORS:** Bersani F; Marinelli F; Ognibene A; Matteucci A; Cecchi S; Santi S; Squarzoni S; Maraldi NM

**AUTHOR:** Dipartimento di Fisica, Universita di Bologna, Italy.

**AFFILIATION:**

**SOURCE:** Bioelectromagnetics 1997;18(7):463-9

**CITATION IDS:** PMID: 9338627 UI: 9748332

**ABSTRACT:** Intramembrane proteins (IMP) represent a class of proteins located in the lipid bilayer of the cell membrane which function as ion channels, enzymes or receptors. Since it has been argued that biological effects of extremely low frequency (ELF) electromagnetic fields are mediated by plasma membrane, this work was designed to study the possible effects of 50 Hz pulsed magnetic fields (PMF) of the type used to stimulate bone repair, on the distribution of IMP in the plasma membrane of Swiss NIII 3T3 fibroblasts. Evaluations were based on the calculation of a distribution factor, which allows discrimination between random, regular and clustered distribution of IMP, in electron microscope images of freeze -fractured membranes. The results indicate that cells exposed to PMF for more than two hours have a significant clustering of the IMP distribution compared to control unexposed cells.

**MAIN MESH HEADINGS:** Electromagnetic Fields/ \*adverse effects

**ADDITIONAL MESH HEADINGS:** Membrane Proteins/ \*metabolism

Animal

Cell Membrane/ metabolism

Cell Membrane/ ultra structure

Freeze Fracturing

Mice

Microscopy, Electron

Support, Non-U.S. Gov't

3T3 Cells

2000/06

2000/20 09:00

**PUBLICATION TYPES:** JOURNAL ARTICLE

**CAS REGISTRY NUMBERS:** 0 (Membrane Proteins)

**LANGUAGES:** Eng

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**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** The genotoxic potential of electric and magnetic fields: an update.

**AUTHORS:** McCann J; Dietrich F; Rafferty C

**AUTHOR:** Research Consultant, 5537 East Highway 89, Kanab, UT 84741, USA.

**AFFILIATION:** jmccann@xpressweb.com

**SOURCE:** Mutat Res 1998 Aug;411(1):45-86

**CITATION** PMID: 9675241 UI: 98342367

**IDS:**

**ABSTRACT:** We review 23 studies on the potential genotoxicity of electric and magnetic fields that have appeared in the published literature since our 1993 review of 55 published studies (McCann et al., Mutat. Res 297 (1993) 61-95) and six additional studies published prior to 1993, which were not previously reviewed. As in our previous review, internal electric fields present in which media (for in vitro experiments) and in the torso (for in vivo experiments) were estimated. Individual experiments are evaluated using basic data quality criteria. The potential for genotoxicity of electric and magnetic fields is discussed in light of the significant body of genotoxicity data that now exists. Three unsuccessful attempts to replicate previously reported positive results have appeared since our previous review. We concluded that, in spite of the 34 studies reviewed in this and or previous publication that report positive genotoxic effects, none satisfy all three basic conditions: independent reproducibility, consistency with the scientific knowledge base, and completeness according to basic data quality criteria. As we discuss, these criteria are satisfied for several groups of negative studies in several exposure categories (ELF magnetic fields, 150 micro T-5 mT, combined ELF electric and ELF magnetic fields, approx. 0.2 mT, 240 mV/m, and static magnetic fields, 1-3.7 T). The evidence reviewed here strengthens the conclusion of our preview, that the preponderance of evidence suggest that ELF electric or magnetic fields do not have genotoxic potential. Nevertheless, a pool of positive results remains, which have not yet been tested by independent replication. Among the 12 studies reviewed here, which report statistically significant or suggestive positive results, we point particularly to results from five laboratories [J. Miyakoshi, N. Yamagishi, S. Ohtsu, K. Mohri, I. Takebe, Increase in hypoxanthine-guanine phosphoribosyl transferase gene mutations by exposure to high-density 50-Hz magnetic fields, Mutat. Res. 349 (1996) 109-114; J. Miyakoshi, K. Kitagawa, H. Takebe, Mutation induction by high-density, 50-Hz magnetic fields in human MeWo cells exposed in the DNA synthesis phase, int. J. Radiat. Biol. 71 (1997) 75-79; H. Lai, N.P. Sigh, Acute exposure to a 60-Hz magnetic field increases DNA strand breaks in rat brain cells, Bioelectromagnetics, 18 (1997) 156-165; H. Lai,

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**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** evaluation of potential genotoxicity of pulsed electric and electromagnetic fields used for bone growth stimulation.

**AUTHORS:** Jacobson-Kram D; Tepper J; Kuo P; San RH; Curry PT; Wagner VO; Putman DL

**AUTHOR:** Genetic Toxicology Division, Microbiological Associates, Inc, Rockville, MD 20850, USA. djcobson-kram@microbio.com

**AFFILIATION:** MD 20850, USA. djcobson-kram@microbio.com

**SOURCE:** Mutat Res 1997 Jan 15;388(1):45-57

**CITATION IDS:** PMID: 9025791 UI: 97178398

**ABSTRACT:** Medical devices emitting pulsed electric and electromagnetic fields have been found to be effective for a number of clinical applications including stimulation of bone and tissue growth. To determine whether pulsed fields of the type used in these clinical applications present a mutagenic hazard, electric and electromagnetic fields at two exposure levels were tested in the Ames test, CHO cell chromosomal aberration assay, BALB/3T3 cell transformation assay and unscheduled DNA synthesis assay in primary rat hepatocytes. For both field types, initial and independent repeat studies were performed for each assay at both clinical and supra clinical doses. In all assays, the results show a lack of cytotoxic, transforming and mutagenic activity. The data suggest that pulsed electric and electromagnetic fields of the type and dose levels used in bone growth stimulation lack mutagenic and transforming activity.

**MAIN MESH HEADINGS:** \*Chromosome Aberrations  
DNA Replication/ \*drug effects  
\*Electricity  
\*Electromagnetic Fields  
Liver/ \*metabolism  
\*Mutagenesis

**ADDITIONAL MESH HEADINGS:** Animal  
Cell Transformation, Neoplastic/ radiation effects  
Cells, Cultured  
CHO Cells  
Escherichia coli/ drug effects  
Hamsters  
Liver/ drug effects  
Male  
Mice  
Mutagenicity Tests  
Rats  
Rats, Sprague-Dawley  
Salmonella typhimurium/ drug effects

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N.P. Sigh, Melatonin and N-tert-butyl-alpha-phenylnitron block 60-Hz magnetic field-induced DNA single and double strand breaks in rat brain cells, J. Pincal Res. 22 (1997) 152-162; T. Koana M. Ikehata, M. Nakagawa, Estimation of genetic effects of a static magnetic field by a somatic cell test using mutagen-sensitive mutants of Drosophila melanogaster, Bioelectrochem. Bioenergetics 36 (1995) 95-100; F.I. Tabrah, HF. Mower, S. Batkin, P.B. Greenwood, Enhanced mutagenic effect of a 60-Hz time-varying magnetic field on numbers of azide-induced TA100 revertant colonies, Bioelectromagnetics 15 (1994) 85-93; S. Tofani, A. Ferrara, L. Anglesio, G. Gilli, Evidence for genotoxic effects of resonant ELF magnetic fields, Bioelectrochem. Bioenergetics, 36 (1995) 9-13], which satisfy most basic data quality criteria and may be of interest. Copyright 1998 Elsevier Science B.V. All rights reserved.

**MAIN MESH HEADINGS:** Electromagnetic Fields/ \*adverse effects  
Mutagenicity Tests/ \*trends  
Mutagens/ \*toxicity

**ADDITIONAL MESH HEADINGS:** Animal  
Cells, Cultured  
Chromosomes/ genetics  
Chromosomes/ radiation effects  
DNA Repair  
Gamma Rays/ adverse effects  
Human  
Lymphocytes/ radiation effects  
Micronucleus Tests  
Salmonella/ genetics  
Support, Non-U.S. Gov't  
Ultraviolet Rays/ adverse effects  
X-Rays/ adverse effects  
1998/07  
1998/24 02:06

**PUBLICATION TYPES:** JOURNAL ARTICLE  
META-ANALYSIS  
**CAS REGISTRY NUMBERS:** 0 (Mutagens)  
**LANGUAGES:** Eng

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**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** Beneficial effects of electromagnetic fields.

**AUTHORS:** Bassett CA

**AUTHOR:** Bioelectric Research Center, Columbia University, Riverdale, New York

**AFFILIATION:** 10463.

**SOURCE:** J Cell Biochem 1993 Apr;51(4):387-93

**CITATION IDS:** PMID: 8496242 UI: 93266659

**ABSTRACT:** Selective control of cell function by applying specifically configured, weak, time-varying magnetic fields has added a new, exciting dimension to biology and medicine. Field parameters for therapeutic, pulsed electromagnetic field (PEMFs) were designed to induce voltages similar to those produced, normally during dynamic mechanical deformation of connective tissues. As a result, a wide variety of challenging musculoskeletal disorders have been treated successfully over the past two decades. More than a quarter million patients with chronically un-united fractures have benefited, worldwide, from this surgically non-invasive method, without risk, discomfort or the high costs of operative repair. Many of the athermal bio-responses, at the cellular and sub-cellular levels, have been identified and found appropriate to correct or modify the pathologic processes for which PEMFs have been used. Not only is efficacy supported by these basic studies but a number of double-blind trials. As understanding of mechanisms expands, specific requirements for field energetics are being defined the range of treatable ailments broadened. These include nerve regeneration, wound healing, graft behavior, diabetes, and myocardial and cerebral ischemia (heart attack and stroke). Preliminary data even suggest possible benefits in controlling malignancy.

**MAIN MESH HEADINGS:** \*Electric Stimulation Therapy

**ADDITIONAL MESH HEADINGS:** \*Electromagnetic Fields

Animal

Bone and Bones/ radiation effects

Bone Diseases/ therapy

Cells, Cultured/ radiation effects

Evaluation Studies

Forecasting

Fractures/ therapy

Gene Expression Regulation/ radiation effects

1993/01 00:00

**PUBLICATION TYPES:** JOURNAL ARTICLE  
REVIEW  
REVIEW TUTORIAL

**LANGUAGES:** Eng

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**National Library of Medicine: IGM Full Record Screen**

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**TITLE:** Time-varying magnetic fields: effect on DNA synthesis.  
**AUTHORS:** Liboff AR; Williams T Jr; Strong DM; Wistar R Jr  
**SOURCE:** Science 1984 Feb 24;223(4638):818-20  
**CITATION IDS:** PMID: 6695183 UI: 84121300  
**ABSTRACT:** Human fibroblasts have exhibited enhanced DNA synthesis when exposed to sinusoidally varying magnetic fields for a wide range of frequencies (15 hertz to 4 kilohertz) and amplitudes ( $2.3 \times 10^{-6}$  to  $5.6 \times 10^{-4}$  tesla). This effect which is at maximum during the middle of the S phase of the cell cycle, appears to be independent of the time derivative of the magnetic field, suggesting an underlying mechanism other than Faraday's law. The threshold is estimated to be between  $0.5 \times 10^{-5}$  and  $2.5 \times 10^{-5}$  tesla per second. These results bring into question the allegedly specific magnetic wave shapes now used in therapeutic devices for bone nonunion. The range of magnetic amplitudes tested encompass the geomagnetic field, suggesting the possibility of mutagenic interactions directly arising from short-term changes in the earth's field.

**MAIN MESH HEADINGS:** DNA/ \*biosynthesis  
**ADDITIONAL MESH HEADINGS:** \*Magnetics  
Cells, Cultured  
Human  
Mutation  
Periodicity  
Support, U.S. Gov't, Non-P.H.S.  
1984/02  
1984/24 00:00

**PUBLICATION TYPES:** JOURNAL ARTICLE

**CAS REGISTRY NUMBERS:** 9007-49-2 (DNA)  
**LANGUAGES:** Eng

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**Auszug von Studien zur Wirksamkeit  
und Sicherheit der Therapie mit pulsierenden  
Elektromagnetischen Feldern (PEMF)**

## Arthrose (Degenerativer Rheumatismus)

*J Rheumatol 1994 Oct. 21 (10) 1903.11*

**The effect of pulsed electromagnetic 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.*

Wir testeten in einer kontrollierten klinischen Studie die Wirksamkeit von pulsierenden elektromagnetischen Feldern (PEMF) in der Behandlung von Arthrosen der Knie und der Halswirbelsäule. Die Behandlung wurde 18 mal je eine halbe Stunde bei 86 Patienten mit Arthrose der Knie und 81 Patienten mit Arthrose der Halswirbelsäule angewendet. Jeweils die Hälfte der Patienten erhielten zu Kontrollezzwecken eine inaktive Scheinbehandlung. Mit einer Serie von standardisierten Fragen wurde erhoben, wie Schmerzen, Lebensqualität, Schmerzen bei passiver Bewegung und die Empfindlichkeit der Gelenke sich veränderten. Eine Gesamtbeurteilung wurde von den Patienten und vom behandelnden Arzt getrennt abgegeben. Diese Erhebungen wurden zu Beginn, in der Mitte und am Ende der Behandlung und einen Monat nach dem Abschluss der Behandlung durchgeführt. Die statistische Auswertung zeigte extrem deutliche Verbesserungen bei den behandelten Patienten am Ende der Behandlung und einen Monat danach in beiden Indikationen (Knie und Halswirbelsäule). Die stärkste Wirkung zeigte sich bei Schmerzen und Schmerzen bei Bewegung sowie in den beiden Gesamtbeurteilungen von den Patienten und dem Arzt. PEMF hat in dieser Studie einen therapeutischen Nutzen bei schmerzhaften Arthrosen der Knie und der Halswirbelsäule bewiesen.

## Osteoporose

*Chir Organi Mov 1994 Jul-Sep; 79(3): 309-13*

### **Electromagnetic Fields in the treatment of postmenopausal Osteoporosis: an experimental study conducted by densitometric, dry ash weight and metabolic analysis of bone tissue**

*Bilotta TW, Zati A, Gnudi S, Figus E, Giardino R, Fini M, Pratelli L, Mongiorgi R  
Servizio di Recupero e Rieducazione Funzionale, Istituto Rizzoli, Bologna*

32 weibliche Ratten wurden im Alter von 10 Monaten kastriert, um die Möglichkeiten pulsierender elektromagnetischer Felder (PEMF) bei der Osteoporose-Prävention bei chirurgisch verursachter Menopause zu untersuchen; PEMF mit 30 Gauss und 70 Gauss wurden angewandt. Nach 4-monatiger Behandlung wurden folgende Tests durchgeführt: Knochendichtemessung an der lumbalen Wirbelsäule, quantitatives Femur-Trockenashengewicht, und hämatologische Beurteilung des Knochenstoffwechsels.

Die Studie erbrachte, dass 30 Gauss-PEMF den Verlust an Knochensubstanz verringerte, während 70 Gauss-PEMF den Knochenverfall hemmte und zu Knochenmineralisierungsdichten und Trochenashengewichten führte, die den entsprechenden Werten der nicht-kastrierten Kontrolltiere sehr ähnlich waren. Hämatologische Untersuchungen zeigten keine signifikanten Unterschiede zwischen den beiden Versuchsgruppen.

## Osteoporose-Vorsorge

*Bioelectromagnetics 1998; 19(2): 75-8*

### **Clinical report on long-term bone density after short-term EMF application**

*Tabrah F.I, Ross P, Hoffmeier M, Gilbert F Jr*

*University of Hawaii School of Medicine, Department of Physiology, Straub Clinic and Hospital, Honolulu 96813, USA*

1984 untersuchte eine Studie Auswirkungen eines pulsierenden elektromagnetischen Feldes (PEMF) mit 72Hz auf die Knochendichte der Radien postmenopausaler, osteoporosegefährdeter Frauen während und nach einer 12-wöchigen PEMF-Behandlung für 10h/Tag. Während der Behandlung stieg die mineralische Knochendichte der Radien im unmittelbaren Wirkungsbereich des Magnetfeldes significantly an, und nahm dann im Lauf der folgenden 36 Wochen ab.

Neuerliche Messungen der Knochendichte der Radien dieser Patientinnen nach 8 Jahren lassen keine Langzeitänderungen erkennen. Die knochendichte-steigernden Auswirkungen von PEMF sollten deshalb alleine und Verbindung mit Übungen und pharmazeutischen Präparaten (z.B. Hormone) weiterführend untersucht werden, als mögliche Prophylaxe bei osteoporosegefährdeten, postmenopausalen Frauen, sowie als möglicher Block gegen Demineralisation.

## Dermatologie

*J Orthop Res 1990 Mar; 8(2): 276-82*

### Effect of low frequency pulsing electromagnetic fields on skin ulcers of venous origin in humans: a double-blind study

*Ieran M, Zaffuto S, Bagnacani M, Annovi M, Moratti A, Cadossi R*

*Department of Medical Angiology, Arcispedale S, Maria Nuova, Reggio Emilia, Italy*

*Publication Types: Clinical trial; Controlled clinical trial*

Doppel-Blindstudie über Auswirkungen elektromagnetischer Felder auf venöse Hautgeschwüre bei 44 Patienten; Aufteilung der Patienten auf eine tatsächlich behandelte Experimentalgruppe, und eine scheinbehandelte Kontrollgruppe; Studiendauer 90 Tage.

Erfolgrate in der Experimentalgruppe nach 90 Tagen ( $p < 0.02$ ), sowie in der nachfolgenden Zeit ( $p < 0.005$ ) signifikant höher als in der Kontrollgruppe; Auswirkungen der elektromagnetischen Felder halten offenbar über die Dauer der eigentlichen Behandlung hinaus an. Keines der Geschwüre in der experimentellen Gruppe verschlechterte sich, im Gegensatz zu 4 Verschlechterungen in der unbehandelten Kontrollgruppe. Unter den Patienten der Experimentalgruppe zeigte sich bei 25% ein erneutes Auftreten der Geschwüre, bei den Patienten der Kontrollgruppe lag die Rate bei 50%. Die Stimulation mit elektromagnetischen Feldern erscheint als brauchbare Zusatztherapie bei der Behandlung dieser Patienten.

## Wundheilung

*Am J Vet Res 1998 Sep. 59(9): 1177-81*

### Evaluation of treatment with a pulsed electromagnetic field on wound healing, clinicopathologic variables, and central nervous system activity of dogs

*Scardino M S, Swaini S F, Sartin EA, Steiss J E, Spano J S, Hoffman C E, Coolman S L, Peppin B L*

**Scott-Ritchey Research Center, College of Veterinary Medicine, Auburn University, AL 36849, USA**

**STUDIENZIEL:** Bewertung der Auswirkungen einer Behandlung mit pulsierenden elektromagnetischen Feldern (PEMF) auf die Heilung genähter und ungenähter Wunden, klinikopathologische Parameter, und die Zentralnervensystem-Aktivität von Hunden.

**STUDIENANLAGE:** In der Haut auf dem Rumpf von Hunden wurden offene und genähte Wunden präpariert. Die Hunde wurden in zwei Gruppen unterteilt, wovon eine einer PEMF-Behandlung unterzogen wurde, während die zweite (Kontroll-)Gruppe unbehandelt blieb. Die PEMF-Therapie mit 2 täglichen Behandlungen begann am Tag vor dem chirurgischen Eingriff

und wurde bis zum 21. Tag nach der Operation fortgesetzt. Die Bewertung der Wunden erfolgte mittels Tensio- und Planimetrie, Laser Doppler Perfuptionsabbildung und histologischer Untersuchung. Klinikopathologische Parameter und elektroencephalographische Aufzeichnungen wurden ebenfalls ausgewertet.

**ERGEBNISSE:** PEMF-Behandlung erbrachte deutlich verbesserte Epithelbildung der offenen Wunden 10 und 15 Tage nach dem chirurgischen Eingriff. Fünf Tage nach dem Eingriff wiesen die Hunde der Kontrollgruppe negative Werte für Wundkontraktion auf, während die PEMF behandelten Wunden positive Werte zeigten. Die PEMF-Therapie hatte keine signifikanten kurzfristigen planimetrischen, tensiometrischen, histologischen, klinikopathologischen oder elektroencephalographischen Auswirkungen.

**SCHLUSSFOLGERUNGEN:** PEMF-Behandlung verbesserte die Epithelbildung ungenähter Wunden, und lieferte Anzeichen für frühe Wundkontraktion ohne signifikante kurzzeitige Änderungen anderer Parameter.

## Gynäkologie

*Eur J Surg Suppl 1994; (574): 83-6*

### **Electrochemical therapy of pelvic pain: effects of pulsed electromagnetic fields (PEMF) on tissue trauma**

*Jorgensen W A, Frome B M, Wallach C  
International Pain Research Institute, Los Angeles, California*

Außergewöhnlich effektive und anhaltende Linderung gynäkologischer Beckenschmerzen wurde durch eine Behandlung der betroffenen Regionen mit pulsierenden elektromagnetischen Feldern (PEMF) erreicht. Die Behandlung ist kurz, wirtschaftlich und hat in vielen Fällen chirurgische Eingriffe erübrigt. Es werden typische Fälle beschrieben, wie Dysmenorrhoe, Endometriose, eingerissene Ovarialzysten, akute Infektionen der unteren Harnwege, postoperative Hämatome und anhaltend Dyspareunie. PEMF-Behandlung war in den meisten Fällen als Einzeltherapie ausreichend, in einigen wenigen Fällen unterstützt durch zusätzliche schmerzstillende Medikation.

Unter 17 Frauen mit einer Gesamtzahl von 20 Fällen von Beckenschmerzen (11 akut, 7 chronisch, 2 akut und chronisch) zeigte sich bei 16 Patientinnen (18 Einzelfälle, –90%) eine deutliche sogar dramatische Besserung. Nur zwei Patientinnen (2 Einzelfälle) waren weiterhin nicht völlig schmerzfrei.

## Multiple Sklerose

*Int J Neurosci 1994 Nov. 79(1-2) 75-90*

### Improvement in word-fluency performance in patients with multiple sclerosis by electromagnetic fields

*Sandyk R*

*NeuroCommunication Research Laboratories, Danbury, CT, USA*

Eine Beeinträchtigung der kognitiven Funktionen ist bei Patienten mit Multipler Sklerose (MS) bekannt, insbesondere bei den chronisch progredienten Fällen. Die kognitiven Symptome bei MS zeigen eine Ähnlichkeit mit denen von Patienten mit dem Stirnlappen-Syndrom, wie z.B. Verminderte Spontaneität der Sprache mit Schwierigkeiten in der Wortfindung. In letzter Zeit wurde über Behandlungserfolge von elektromagnetischen Feldern (EMF) bei MS Patienten in Bezug auf die motorischen und kognitiven Funktionen berichtet. Dieser Bericht behandelt von drei Frauen mit MS (mittleres Alter: 44,3 +/- 8,5 Jahre, mittlere Krankheitsdauer: 18,3 +/- 3,5 Jahre). zwei mit einem chronisch progredientem Verlauf und eine mit einem schubförmig remittierendem Verlauf. Vor Behandlungsbeginn und nach einer Serie von 4 bis 5 EMF Behandlungen wurde der Thurstone Wort-Geläufigkeitstest, ein anerkannter Test für die Erhebung der Stirnlappenfunktion, durchgeführt. Vor der Behandlung waren die Ergebnisse in der Wortgeläufigkeit für alle Patienten unter den Werten von Kontrollgruppen (mittlere Leistung der MS Patienten: 42,6 +/- 1,1 Wörter vs. 79,0 +/- 6,2 Wörter bei der Kontrollgruppe). Die EMF Behandlung führten zu einer 100% Steigerung in der Wortgeläufigkeit innerhalb kurzer Zeit (im Mittel: 83,3 +/- 14 Wörter). Diese Ergebnisse unterstützen die Annahme, dass EMF Behandlungen die Stirnlappenfunktion bei MS Patienten verbessern und einen positiven Einfluss auf die kognitiven Funktionen dieser Patienten.

## Migräne

*Headache 1998 Mar; 38(3): 208-13*

### Initial exploration of pulsing electromagnetic fields for treatment of migraine

*Sherman RA, Robson L, Marden LA*

*Service of Orthopedic Surgery, Madigan Army Medical Center, Tacoma, Wash. 98431, USA*

*Publication Types: Clinical trial; Randomized controlled trial*

23 Patienten mit chronischer Migräne erhielten eine Behandlung mit pulsierenden elektromagnetischen Feldern (PEMF).

1) **Offene Studie:** 11 Personen führten über einen Zeitraum von je 2 Wochen vor und nach einer 2-3- wöchigen PEMF- Behandlung (1 h/ Tag; 5 Tage/ Woche) Aufzeichnungen über ihre Kopfschmerzen. Während der ersten beiden Wochen nach der Behandlung sank die Zahl der Migräneanfälle/Woche von 4.03 auf 0.43; im Lauf eines erweiterten Beobachtungszeitraumes von durchschnittlich 8.1 Monaten sank die Zahl der Anfälle weiter auf 0.14/Woche.

2) Doppelblindstudie: 9 Personen führten 3-wöchige Kopfschmerz-Aufzeichnungen und wurden nach dem Zufallsprinzip für eine 2-wöchige Behandlung mit entweder aktiver oder vorgetäuschter PEMF-Therapie ausgewählt. Nach Ablauf der 2 Wochen erfolgte eine erneute 2-wöchige Behandlung mit der jeweils anderen Therapie (aktiv oder Placebo). anschließend führten die Patienten erneut 3-wöchige Kopfschmerz-Aufzeichnungen. 3 Personen erhielten lediglich eine PEMF- Behandlung mit halber Feldstärke.

Jene 6 Patienten die eine aktive PEMF-Therapie mit voller Feldstärke erhielten zeigten einen Rückgang der wöchentlichen Migräneanfälle von 3.32 auf 0.58. Die, nur mit halber Feldstärke behandelten, 3 Patienten ließen keinen Rückgang der Kopfschmerz-Aktivität erkennen.

## Parkinson

*Int J Neurosci 1994 Jul; 77(1-2): 23-46*

### Improvement in word-fluency performance in Parkinson's disease by administration of electromagnetic Fields

*Sandyk R*

*Neuro Communication Research Laboratories, Danbury, CT 06811*

Das Erkennen des Zusammenhanges zwischen der Degeneration des Dopamin(DA)-Systems der Substantia nigra und den motorischen Manifestationen des Parkinson-Syndroms (PS) gaben Anstoß zur Entwicklung der DA-Erstatz-Therapie. Klinische Erfahrung hat jedoch gezeigt, dass dopaminerge Medikamente zwar die motorischen PS-Symptome abschwächen, aber nur geringe bis keine Auswirkungen auf die geistigen und kognitiven Symptome der Krankheit haben, welche als zumindest teilweise mit einer Degeneration des meso-cortical-limbischen DA-Systems in Verbindung gebracht werden. Dass dopaminerge Medikamente die geistigen und kognitiven Unzulänglichkeiten bei PS nicht verbessern, deutet darauf hin, dass diese Substanzen die DA-Funktionen in den meso-cortical-limbischen Bahnen nicht vollständig wiederherstellen können.

Die Anwendung einer Behandlungsserie mit elektromagnetischen Feldern (EMF) von extrem niederer Intensität (im Picotesla Bereich) bewirkte bei 5 voll-medizinierten PS-Patienten eine dramatische Verbesserung in der Leistung bei einem "Welt-Gewandtheits" –Test nach Thurstone, einem empfindlichen Maßstab der Frontal-Loben Funktion.

Die Ergebnisse lassen vermuten, dass im Gegensatz zur DA-Ersatz-Therapie, die Anwendung niederenergetischer EMF zu verbesserter Frontal-Loben Funktion bei PS-Patienten führt, vermutlich durch Steigerung der DA-Aktivität im mesocorticalen System. Da ein Mangel im frontalen DA-System auch als Ursache für Bewegungshemmung und Erstarren bei PS vermutet wird, können die Beobachtungen vielleicht auch die vorteilhaften Auswirkungen von EMF auf die motorischen Auswirkungen der Krankheit erklären.

## Alzheimer

*Int J Neurosci 1994 Jun, 76(3-4) 185-225*

### **Alzheimer's disease: improvement of visual memory and Visuoconstructive performance by treatment with picotesla range Magnetic fields**

*Sandyk R*

*NeuroCommunication Research Laboratories, Danbury, CT 06811*

Beeinträchtigungen der visuellen Erinnerung und von visuokonstruktiven Funktionen finden sich häufig bei Patienten mit Alzheimer-Krankheit (AK). Bei Patienten mit Parkinson-Syndrom hat die äußerliche Anwendung elektromagnetischer Felder (EMF) extrem niedriger Intensität (im Picotesla Bereich) und niedriger Frequenz (5-8Hz) Verbesserungen von Visuellem Gedächtnis und visuoperzeptiver Funktionen bewirkt. Da demente Parkinson-Patienten pathologische und klinische Merkmale der Alzheimer-Krankheit aufweisen, wurden die Auswirkungen extrem schwacher EMF auf das visuelle Gedächtnis und die visuokonstruktive Leistung von zwei AK-Patienten untersucht. Mittels "Rey-Osterrieth Complex Figure" Tests, sowie Zeichnen eines Hauses, eines Fahrrades und eines Menschen aus dem Gedächtnis, wurde die Effektivität der EMF-Behandlung überprüft.

EMF-Behandlung führte bei beiden AK-Patienten zu einer dramatischen verbesserung im visuellen Gedächtnis und in der visuokonstruktiven Leistungsfähigkeit; gleichzeitig kam es zu einem Anstieg der Lebensenergie, der sozialen Kontaktfähigkeit, der Gemütsverfassung sowie zu einer Verbesserung kognitiver Funktionen, wie Kurzzeigedächtnis, Rechenfähigkeit, räumliche Orientierung, Beurteilungs- und Argumentationsfähigkeit.

Es wurde gezeigt, dass bestimmte kognitive Symptome der Alzheimer-Krankheit durch EMF-Behandlung mit bestimmter Intensität und Frequenz gebessert werden. Die rasch eintretenden kognitiven Verbesserung durch EMF lassen vermuten, dass einige der mentalen Schwächen bei AK reversibel sind und durch funktionale als durch strukturelle Störungen der neuronalen Kommunikation im Zentralnervensystem ausgelöst werden.

## Schlafstörungen

*Sleep 1996 May: 19(4): 327-36*

### **Effects of low energy emission therapy in chronic psychophysiological Insomnia**

*Pasche B, Erman M, Hayduk R, Mitler M M, Reite M, Higgs L, Kuster N, Rossel C, Dafni U, Amato D, Barbault A, Lebet J P*

**Symtonic USA, Inc, New York, New York 10162, USA**

Nieder-energetische Emission-Therapie (LEET) erscheint als eine wirkungsvolle Methode bei der Behandlung psychophysiologischer Schlaflosigkeit. LEET besteht aus amplitudenmodulierten elektromagnetischen Feldern, die über ein elektrisch leitendes Mundstück direkt auf die Wangenschleimhaut übertragen werden.

Die Auswirkungen von LEET auf chronische psychophysiologische Schlaflosigkeit wurden an 106 Patienten mittels Polysomnographie (PSG) und Schlafbewertungsformularen ermittelt. Aktive oder inactive LEET wurde am späten Nachmittag 3 mal/Woche für jeweils 20 min. für eine Gesamtzahl von 12 Behandlungen verabreicht. Primäre Bewertungskriterien der Effizienz der Behandlungsergebnisse waren Änderungen in der PSG-bewerteten "Gesamt-Schlafzeit" ("Total sleep time", TST) sowie in der Schlaf-Latenz (SL); sekundäre Bewertungskriterien waren Änderungen der Schlaf-Effizienz und Schlaf-Stadien, sowie Patientenberichte zu St. und TST.

Die aktiv behandelte Gruppe ließ einen signifikanten, PSG-ermittelten, TST-Anstieg über den Behandlungszeitraum erkennen (76.0 +/- 11.1 min.: p=0.0001). Der TST Anstieg bei der plazebo-behandelten Kontrollgruppe war statistisch nicht significant. Die aktiv behandelte Gruppe zeigte auch eine. PSG-ermittelte, SL-Abnahme während des Behandlungszeitraumes (-21.6 +/- 5.9 min: p=0.0006), wohingegen der SL-Rückgang in der Kontrollgruppe nicht statistisch significant war. Die Zahl der Schlafzyklen/Nacht stieg während der aktiven Therapie um 30% (p=0.0001), blieb jedoch während der inaktiven Behandlung unverändert. Die Patienten erlitten keine wiederkehrende Schlaflosigkeit und es traten keine nennenswerten Nebeneffekte auf.

LEET (20 min., 3mal/Woche) steigerte TST und reduzierte SL bei Personen mit psychophysiologischer Schlaflosigkeit. LEET ist sicher, gut verträglich, und verbesserte, bei 12 Behandlungen in 4 Wochen, den Schlaf chronischer Schlafloser durch eine Steigerung der Schlafzyklen, wobei der prozentuelle Anteil der einzelnen Schlafstadien/Nacht unverändert blieb. Im Gegensatz zu medikamentösen Therapien, ähnelt das von LEET bewirkte Schlafmuster viel eher natürlichem Schlaf. LEET erscheint daher als eine attractive alternative Behandlungsmöglichkeit bei chronischer Schlaflosigkeit.

## **Verdauung**

*Eur Surg Res 1998: 30(4): 268-72*

### **Effect of magnetic stimulation on the contractile activity of the rectum in the dog**

**Shafik A**

*Department of Surgery and Experimental Research. Faculty of Medicine, Cairo University, Egypt*

**STUDIENABSICHT:** Untersuchung der Auswirkungen magnetischer Stimulation auf rektalen Druck und Entleerung im Hinblick auf mögliche Anwendungen bei der Entleerung des inaktiven oder neuropathischen Rektums.

**METHODEN:** Sowohl bei gefültem, wie auch bei entleertem Rektum wurden während der sakralen magnetischen Stimulation rektaler Druck, Rektumhals-Druck und Blasendruck gemessen, sowie die EMG-Aktivität der beiden Musculus rectus abdominis. Stimulationsparameter: 70% Intensität, 20 Hz, Stoßdauer 1-5 Sekunden.

**ERGEBNISSE:** Sakrale magnetische Stimulation des vollen und des entleerten Rektums bewirkte einen signifikanten Anstieg des rektalen Drucks ( $p < 0.01$ ) und des Blasendrucks ( $p < 0.01$ ), sowie eine Abnahme des Rektumhals-Druckes ( $p < 0.01$ ). Stoßweise magnetische Stimulation bewirkte bei allen Versuchstieren eine Entleerung des vollen Rektums.

**SCHLUSSFOLGERUNG:** Sakrale magnetische Stimulation bewirkte Entleerung des Rektums. Diese einfache und unaufdringliche Therapiemethode Könnte sich bei der Behandlung inaktiver Verstopfung und neuropathischen Rektums als wirksam erweisen.

## Psoriasis

Minerva Med 1984 Oct 20; 75 (40): 2381 – 7

### Initial experiences in the treatment of psoriasis with pulsating magnetic fields

Castelpietra R, Dal Conte G

Die Wirksamkeit pulsierender Magnetfelder bei der Psoriasis-Bekämpfung wurde an 110 Patienten untersucht. Beste Heilungserfolge wurden in der Kopfhaut-Region erzielt (100%-iger

Erfolg), bei typischem flächigen Befall bei Männern (73.7%), sowie bei P. guttata bei Frauen (75%). Patienten in der 2., 5., und 6. Lebensdekade sprachen auf die Behandlung am besten an, desgleichen war der Behandlungserfolg bei bereits länger bestehender Infektion größer als bei vergleichsweise jüngerem Befall. Ein Behandlungsbeginn im Zeitraum März-April erwies sich als besonders wirkungsvoll (80%-iger Erfolg). Nennenswerte Nebenwirkungen wurden nicht beobachtet.

## Augen: Glaukom

Oftalmol Zh 1990; (3): 154-7

### The effect of a pulsed electromagnetic field on the hemodynamics of eyes with glaucoma

Tsisel'skii I V, Kashintseva L T, Skrinnik A V

Untersuchung des Einflusses pulsierender elektromagnetischer Felder (PEMF) auf die Hämodynamik weitwinkel-glaukomatöser Augen. Beobachtungen an 150 Patienten (283 Augen) mit latentem, anfänglichem und fortgeschrittenem Glaukom ergaben einen **positiven PEMF-einfluß auf die Hämodynamik glaukomatöser Augen:** Anstieg des rheographischen Koeffizienten in 87.99%, und des relativen Pulsvolumens in 81.63% der Fälle. Der Grad des Anstieges und der Wiederherstellungshäufigkeit der rheographischen Werte glaukomatöser

Augen'unter dem Einfluss von PEMF auf der Altersnorm entsprechende Werte ist deutlicher in der Anfangsphase der glaukomatösen Entwicklung (latentes und anfängliches Glaukom).

## Tinnitus

*Vestn Otorinolaringol 1998; (1): 59-60*

**Treatment of subjective noise in the ear by impulse low-frequency electromagnetic field (preliminary results)**

*Patiakina O K, Antonian R G, Zaogorskaia E E*

25 Patienten mit subjektiver Lärmempfindung in den Ohren, hauptsächlich bei neurosensorischer Hypakusis, wurden niederfrequenten pulsierenden elektromagnetischen Feldern (PEMF) ausgesetzt. Die Beschwerden bestanden seit 1 – 10 Jahren; traditionelle Therapie war erfolglos. Die subjektive Lärmempfindung wurde durch die PEMF-Therapie bei 2 Patienten zum Verschwinden gebracht, bei 19 Patienten wurde sie deutlich (60 %) vermindert, oder änderte die Tonlage. Die Verbesserung hielt nach 6 – 12 Monaten weiterhin an; **PEMF erscheint somit als eine brauchbare klinische Behandlungsform.**

## Schmerzen des Bewegungsapparates

*Neuroreport 1998 Jun 1, 9 (8) 1745-8*

**The effect of repetitive magnetic stimulation on localized musculoskeletal pain**

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**Publication Types: Clinical trial; Randomized controlled trial**

Magnetische Stimulation aktiviert erfolgreich neurale Strukturen ohne tiefplazierte Elektroden, und ohne die damit verbundenen lokalen Beschwerden, wie sie bei der transcutanen elektrischen Schmerzkontrolle auftreten. Die Möglichkeiten der Bekämpfung lokaler muscoskelettaler Beschwerden wurden durch wiederholte magnetische Stimulation der empfindlichen Körperstellen getestet.

30 Patienten erhielten nach dem Zufallsprinzip eine 40-minütige aktive, oder vorgetäuschte magnetische Behandlung. Nach nur einer Behandlung übertrafen die Heilungseffekte der aktiven magnetischen Stimulation eindeutig jene der Placebo-Behandlung: Die Bewertung der Schmerzintensität sank auf einer 101-Punkte Skala bei den aktiv behandelten Patienten um

59%, bei den scheinbehandelten Patienten um 14% ( $z = -3.26$ ,  $p = 0.001$ ). Die Beschwerdefreiheit hielt für gewöhnlich mehrere Tage an.

**Wie die Ergebnisse zeigen, verringert kräftige magnetische Stimulation erfolgreich lokale muscoskelettale Schmerzen.**

## Künstliche Gelenke

*Anticancer Res 1996 Sep-Oct; 16 (5A): 2853-6*

**The effect of pulsing electromagnetic field on bone ingrowth into a porous coated implant**

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Elektromagnetische Stimulation fördert die Knochenbildung bei Frakturen und Pseudarthrose. Die Studie untersuchte die Anwendungsmöglichkeiten elektromagnetischer Felder bei der Anregung des Knochenwachstums in ein oberflächen-poröses Implantat. Ein Titan-Implantat aus einem Mantel aus Kügelchen mit einem Durchmesser von 250-300  $\mu\text{m}$  um einen Zentralkern von 1.7mm Durchmesser, wurde in die Humerus-Höhle eines Kaninchen eingesetzt. Der

Humerus wurde dann für 14 Tage mit pulsierenden elektromagnetischen Feldern stimuliert (2 Gauss, 10Hz, 25ms).

Messungen des Umfanges des in das Implantat eingewachsenen Knochens zeigten eine deutliche Förderung des Einwachsens des Knochens. **Die Ergebnisse legen nahe, dass elektromagnetische Stimulation das Einwachsen von Knochen in porös-ummantelte Implantate begünstigt.**

## Ischias

*Brain Res 1989 Apr 24; 485 (2): 309-16*

**Stimulation of rat sciatic nerve regeneration with pulsed electromagnetic fields**

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Es wurden die Auswirkungen pulsierender elektromagnetischer Felder (PEMF) auf die Regeneration des Ischias-Nervs nach einer Quetsch-Verletzung bei Ratten untersucht. Die Ratten wurden PEMF mit einer Frequenz von 2 Hz und einer Flussdichte von 0.3 mT ausgesetzt. **Eine 3-6 Tage andauernde Behandlung von 4 h/Tag steigerte die Nervenregeneration um 22%;** Behandlungen von 1-10 h/Tag waren gleich effektiv. Eine signifikant gesteigerte Regeneration stellte sich auch bei Ratten ein, die 4 Stunden täglich für 7 Tage vor der Verletzung mit PEMF behandelt worden waren, jedoch für drei Tage nach der Verletzung unbehandelt blieben. Dieser "konditionierende" Effekt durch Vorausbehandlung lässt vermuten, dass PEMF die Nervenregeneration indirekt beeinflusst.

## Kreuzbandriss

*J Orthop Sports Phys Ther 1993 Apr; 17 (4): 177-84*

### Effects of electrical and electromagnetic stimulation after anterior cruciate ligament reconstruction

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Diese Studie untersuchte die Wirksamkeit neuromuskulärer elektrischer Stimulation (NMES) sowie einer kombinierten elektrisch/elektromagnetischen Stimulation durch pulsierende elektromagnetische Felder (NMES/PEMF) bei der Bekämpfung von Umfangverlust, Schmerz und Schwäche der Knie-Extensormuskeln während 6 Wochen nach der operativen Wiederherstellung des vorderen Kreuzbandes.

17 Patienten mit operativ wiederhergestellten Kreuzbändern nahmen an der Studie teil, aufgeteilt auf eine Kontrollgruppe (N = 3), eine NMES-Gruppe (N = 7), und eine NMES/PEMF-Gruppe (N = 7). Die Patienten der NMES/PEMF-Gruppe bewerteten jede Stimulationsmethode hinsichtlich des dabei empfundenen Schmerzes, zusätzlich wurden Drehmomentmessungen vorgenommen. Die Ergebnisse der Drehmomentmessungen ergaben bei NMES/PEMF-Patienten einen durchschnittlichen Rückgang um 13.1%. die durchschnittliche Abnahme des Oberschenkelumfangs betrug 8.3% in der Kontrollgruppe, 0.5% in der NMES-Gruppe, und 2.3% in der NMES/PEMF-Gruppe. Die NMES/PEMF-Patienten werteten die NMES-Behandlung als etwa doppelt so schmerzhaft wie die NMES/PEMF-Behandlung.

Die Ergebnisse lassen den Schluss zu, daß sowohl NMES-als auch NMES/PEMF-Behandlung erfolgreich den Verlust an Oberschenkelumfang verlangsamen, daß jedoch die kombinierte NMES/PEMF-Therapie weniger schmerzvoll ist, als die alleinige Anwendung von NMES.

## Sehnenentzündung

*Arch Phys Med Rehabil 1997; 78 (4): 399-404*

**Pulsed magnetic and electromagnetic fields in experimental achilles tendonitis in the rat:  
a prospective randomized study**

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**Publication Types: Clinical trial; Randomized controlled trial**

**STUDIENZIEL:** Zufallgesteuerte Untersuchung der Auswirkungen pulsierender magnetischer Felder (PMF) und pulsierender elektromagnetischer Felder (PEMF) auf das Heilungsverhalten experimenteller Entzündung der Achillessehne von Ratten.

**METHODE:** Freilengung der Achillessehne bei 180 Ratten und Verletzung durch ein fallendes Gewicht von 98.24g aus 35cm Höhe; 15min/Tage Behandlung mit PMF mit 17Hz oder 50Hz, mit

PEMF mit 15Hz oder 46Hz, oder vorgetäuschte inaktive Behandlung; zufällig ausgewählte Tiere wurden 2 Stunden nach der Operation getötet, sowie nach 1, 3, 7, 14 und 28 Tagen; Bestimmung von Wassergehalt, Gewicht und histologischem Befund der Sehnen.

**ERGEBNISSE:** Zeitspanne seit der Verletzung und Behandlungsmethode beeinflussten signifikant den Wassergehalt der Bänder (two-way ANOVA,  $p = 0.02$ )

Am 3. Tag war der Wassergehalt in der mit 46Hz-PEMF behandelten Gruppe signifikant am höchsten, nahm dann bis zum 7. Tag stark ab, und blieb anschließend dem der anderen Gruppen vergleichbar. Am Ende der Behandlung unterschied sich der Zustand der mit 15Hz-PEMF behandelten Gruppe nicht wesentlich von dem der unbehandelten Kontrollgruppe.

Die mit 50Hz-PMF behandelte Gruppe zeigte am 7. Tag einen signifikant geringeren Wassergehalt als die Kontrollgruppe ( $p = 0.03$ ), am 14. Tag bestand jedoch kein Unterschied mehr zwischen den beiden Gruppen. PMF mit 50Hz unterdrückten während der frühen Entzündung die Ausbildung extravasculärer Ödeme. Die mit 17Hz-PMF behandelte Gruppe zeigte einen ähnlichen Anfangstrend, und erbrachte während der gesamten Experimentdauer einen konstant niedrigeren Wassergehalt, der am Ende der Behandlung statistisch signifikant war.

Am Ende der Behandlung waren die Kollagenfasern in allen Gruppen wieder  $\pm$ normal ausgerichtet, wobei die mit 17Hz-PMF behandelte Gruppe die der physiologischen Orientierung ähnlichste Ausrichtung erkennen ließ.

**SCHLUSSFOLGERUNGEN:** In allen Gruppen kehrten die Sehnen zur Normalität zurück, bei der mit 17Hz-PMF behandelten Gruppe zeigte sich jedoch eine bessere Anordnung der Kollagenfasern. Die Behandlung mit 17Hz-PMF bewirkte eine deutlichere Entzündungshemmung und eine bessere Rückkehr der Sehnen zu histologischer

**Normalität.** Die Anwendung verschiedener PMF und PEMF, je nach Beginn der Behandlung nach erlittener Verletzung, wäre möglich; bei unmittelbar auf die Verletzung folgendem Behandlungsbeginn ist einer Anwendung von PMF mit 17Hz der Vorzug zu geben.

## Knochenbrüche

*Bangladesh Med Res Counc Bull 1993 Dec; 19 (3): 103-12*

### Effect of PEMF on fresh fracture-healing in rat tibia

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An Hand von 80 Ratten wurde die mögliche Heilwirkung pulsierender elektromagnetischer Felder (PEMF) auf experimentelle Tibia-Frakturen getestet. Bei allen Ratten wurden Tibia und Fibula in der Mitte durchtrennt und die Fragmente anschließend mit intramedullären Nägeln in eingerichteter Stellung fixiert. Die so gehandelten Tiere wurden auf zwei Gruppen zu je 40 Individuen aufgeteilt; innerhalb jeder Gruppe wurden 20 Tiere für die experimentelle Behandlung herangezogen, während 20 als unbehandelte Kontrollgruppe dienten.

Ab dem dritten Tag nach der Osteotomie wurden die Operationsstellen der experimentellen Ratten für 9h/Tag mit PEMF behandelt; die Kontrolltiere erhielten keine Behandlung. Die Tiere der ersten Gruppe wurden nach einer Woche getötet, jene der zweiten Gruppe nach drei Wochen. Die Kallusbildungen wurden radiologisch und mikroskopisch untersucht; Kallusmessungen wurden statistisch ausgewertet. Die Kallusbildung wurde als Kriterium für die Beurteilung der Heilung der Frakturen gewertet.

**Die Ergebnisse erbrachten eine deutliche Steigerung der Heilung der Tibia-Brüche bei den mit PEMF behandelten Ratten, wobei der Unterschied zur Kontrollgruppe nach drei Wochen besonders ausgeprägt war.**

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