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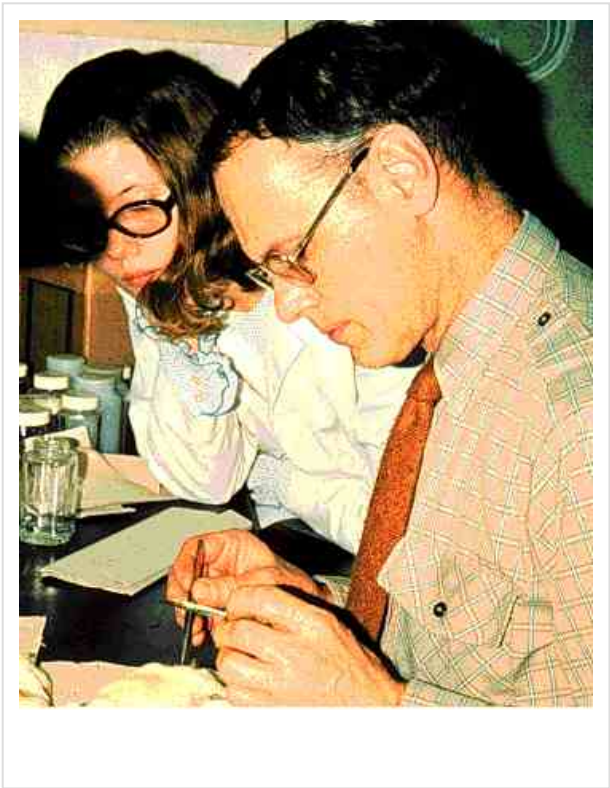
Robert O. Becker MD: Research Bibliography



"You have certainly
come up with something
that makes me sleep."
- Robert O.Becker, M.D.



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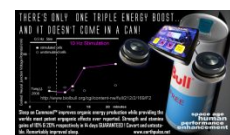


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"I highly recommend
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-Dr. Sinatra

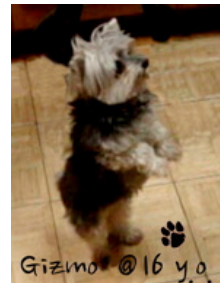


In his June '07 issue of Heart, Health & Nutrition
newsletter, Dr Sinatra reports that EarthPulse solved
his issue with staying asleep through out the night.

"One formerly sleep-deprived
editor has now stopped
counting sheep and is
eternally grateful for the Z's."



-Alternative Medicine Magazine - 9-05, pg 121



"I feel pulsed electromagnetic
therapy may be one of the
greatest discoveries in the
history of medicine."
-Dr. David G. Williams





5,814,094

1

IONTOPHERETIC SYSTEM FOR
STIMULATION OF TISSUE HEALING AND
REGENERATION

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an iontopheretic system
for the stimulation of tissue healing and regeneration. In
particular, the present invention relates to a method and
device for stimulation of tissue healing and regeneration,
composition for use therewith, and methods for making the
composition.

2. Discussion of Background

Healing, like all other biological processes, is a cellular
process. The occurrence of an injury immediately triggers
the onset of this process, which continues until the injury is
healed. Although its exact mode of action is not yet
understood, it is clear that a feedback mechanism monitors
the extent of tissue damage and adjusts cellular activity in
the injured area to produce the exact amount of healing
needed.

As used herein, the terms "wound" and "injury" refer to
tissue damage or loss of any kind, including but not limited
to cuts, incisions (including surgical incisions), abrasions,
lacerations, fractures, contusions, burns, and amputations.

Healing processes can be classified into three types,
determined by how the cells in the injured area react to the
injury. The simplest type of healing is scarification healing,
wherein cells at the edges of a wound produce collagen and
elastic fibers which simply bind the edges of the wound
together without restoring severed nerves or blood vessels.
This type of healing produces a visible scar, and sometimes
results in numbness and circulatory inadequacy in the region
of the wound and regions distal thereto. In the higher
animals, including man, the heart, skeletal muscle, and nerve
tissue (including the brain) heal by scarification.

A second type of healing is tissue replacement, wherein
the cells of some body tissues produce more cells of their
own kind to replace missing portions. In humans, the skin
and portions of the gastrointestinal tract heal by replace-
ment. In this type of healing, the replacement rate of the cells
in the injured area increases to produce sufficient numbers of
cells to help heal the injury, then returns to normal after
healing is complete. Replacement is effective only if enough
normal cells of the needed types are present in the area, and
only for the particular types of cells that are capable of
healing in this manner. Replacement is often inadequate for
healing full-thickness skin wounds, which frequently heal
with limited re-epithelialization, resulting in poorly
insensitized, thin and inelastic skin, while substantial soft
tissue defects heal primarily by scarification. However, such
results are generally adequate for function if the wound is on
the torso or the extremities (excepting the hand).

The most effective—and most complex—type of healing
is regeneration. This type of healing is capable of replacing
entire limbs and internal organs, and even portions of the
brain and heart. Regeneration is a biphasic process. In the
first phase, normal, mature cells at the site of the injury
revert to an embryonic, unspecialized form ("de-
differentiate"). These cells multiply rapidly, then become
activated and demonstrate a variety of energetic processes
which may include amitotic division, nuclear transfer,
migration of free nuclei into residual tissues, and production
of exceptionally large cells containing nuclear material from
a number of individual de-differentiated cells (thus, "acti-

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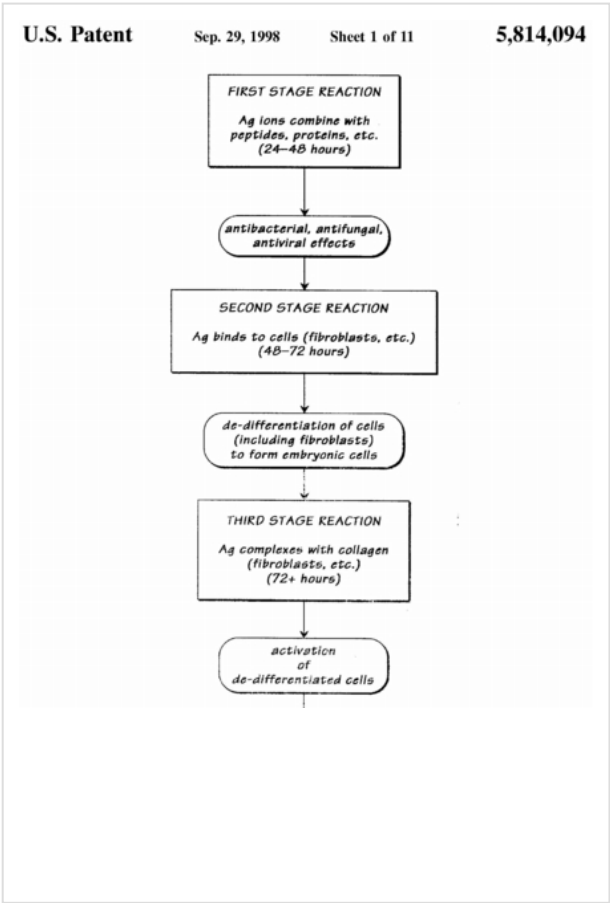
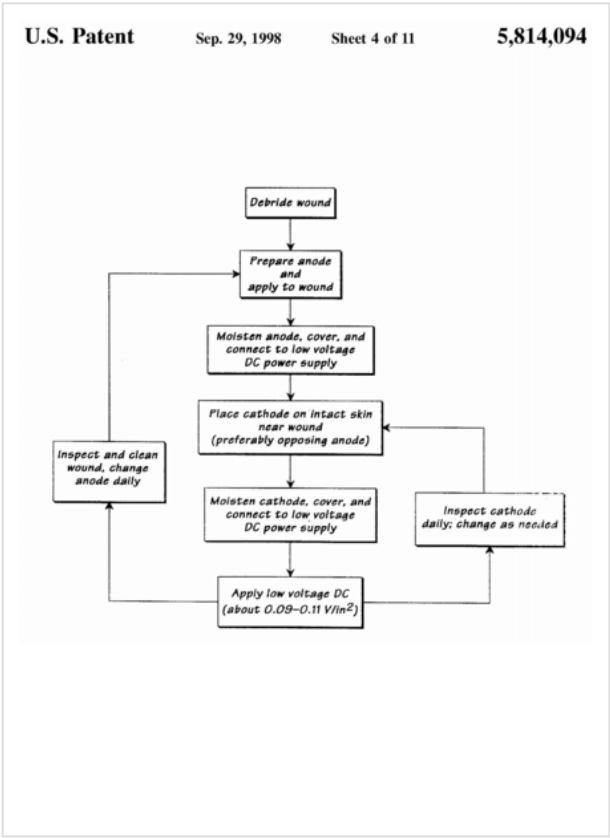
Page 1 of the Robert O. Becker / Flick 1998 U.S.
Patent 5,814,094



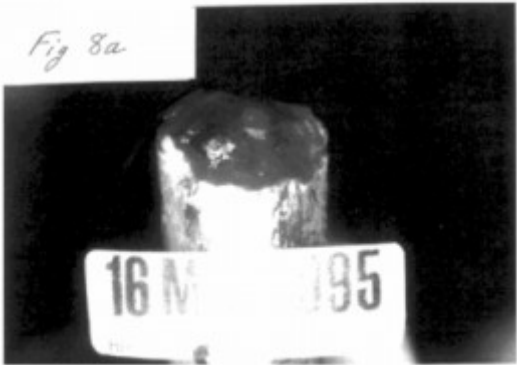
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Bibliographies

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Becker RO, Exploring new horizons in electromedicine, Journal of Alternative Complementary Medicine 2004 Feb;10(1):17-8., PMID: 15025873

Becker RO, Induced dedifferentiation: a possible alternative to embryonic stem cell transplants, NeuroRehabilitation. 2002;17(1):23-31, PMID: 12016344

Department of Orthopedic Surgery, Upstate Medical Center, State University of New York, Syracuse, NY 13210, USA.

Induction of local tissue regeneration in the human would best be accomplished if the patient's own cells at the desired site could be caused to dedifferentiate into the required embryonic stem cells. A system involving the electrical iontophoretic introduction of free silver ions into human wounds for their antibiotic effect has been in clinical use since 1975. In addition to a major antibiotic effect, the technique was found to produce the regeneration of all local tissues, apparently by stimulating dedifferentiation of mature human cells. More recently the use of a newly developed silvered nylon fabric has been found to have similar results without the need for electrical parameters. The results of a preliminary laboratory and clinical study of this material are presented.

Becker RO, Silver ions in the treatment of local infections, Met Based Drugs,1999;6(4-5):311-4., PMID: 18475906, PMCID: PMC2365176

Department of Orthopaedic Surgery State University of New York Health Science Center at Syracuse 550 Harrison Street Syracuse New York 13202 USA.

A study of the use of free silver ions as an antibacterial and antifungal agent administered to infected local wounds has been conducted over the past two decades. A variety of iontophoretic techniques has been employed utilizing either pure silver wires or several types of silvered nylon fabrics as anodes in a direct current electrical circuit. A new type of silver nylon has recently been evaluated for the same use without iontophoretic current. In vitro studies of both techniques have demonstrated an effective, broad spectrum antibiotic effect including most silver-resistant strains. Over 100 cases of recalcitrant osteomyelitis have been treated with an overall success rate of approximately 65% and no evidence of argyria.

Becker RO, Electromagnetism and the revolution in medicine, Acupuncture & Electro-therapeutic Research ,1987;12(1):75-9., PMID: 2883840

Becker RO, Esper C., Electrostimulation and undetected malignant tumors, Clinical orthopaedics and related research,1981 Nov-Dec;(161):336-9, PMID: 7198021

Webster DA, Spadaro JA, Becker RO, Kramer S., Silver anode treatment of chronic osteomyelitis, Clinical Orthopedics and Related Research, 1981 Nov-Dec; (161):105-14., PMID: 6975686

Twenty-five patients with active, chronic osteomyelitis, resistant to conventional management, were treated with surgical debridement and daily application of electrically activated silver dressings. Sixteen (64%) cases resulted in closed, stable, pain-free wounds, with the remainder resulting in persistent drainage or amputation. Nine of 12 cases complicated by nonunion achieved union. In 13 patients an open-bone graft was performed and silver treatment continued: these tended to remain free of purulent

drainage but fared no better than average in the long-term follow-up. The silver anode dressing seems to be an effective aid in the treatment of chronic bone infection when combined with adequate surgical debridement, thereby reducing the need for prolonged systemic antibiotics.

Perry FS, Reichmanis M, Marino AA, Becker RO, Environmental power-frequency magnetic fields and suicide, Health physics, 1981 Aug;41(2):267-77, PMID: 7275611

Marino AA, Cullen JM, Reichmanis M, Becker RO, Hart FX, Sensitivity to change in electrical environment: a new bioelectric effect, The American journal of physiology, 1980 Nov;239(5):R424-7, PMID: 7435656

The action of a 60-Hz, 5 kV/m electric field on erythrocyte parameters in mice was determined. No effects attributable to the magnitude of the field were found, but a transition either from or to an environment containing the field caused decreased red blood cell concentrations and decreased hematocrits. The failure of others to observe effects on erythrocyte parameters following exposure to low-frequency electric fields may have been due to an inappropriate choice of duration of exposure.

Marino AA, Spadaro JA, Fukada E, Kahn LD, Becker RO, Piezoelectricity in collagen films, Calcified Tissue International, 1980;31(3):257-9, PMID: 6781732

Tissue collagen exhibits several levels of structural organization, and this complicates efforts to determine the origin of its piezoelectricity. We made collagen films-by evaporation and electrodeposition from solution-and examined the relation between collagen's piezoelectricity and its electron microscopic appearance. We found that the electrodeposited films were more organized and exhibited higher piezoelectric coefficients than the evaporated films. Despite this, the evaporated films were piezoelectric, thereby suggesting that the effect originates either at the level of the tropocollagen molecule or, at most, with aggregated structures no larger than 50 Å in diameter.

Marino AA, Cullen JM, Reichmanis M, Becker RO, Fracture healing in rats exposed to extremely low-frequency electric fields, Clinical Orthopedics and Related Research, 1979 Nov-Dec;(145):239-44, PMID: 317035

Fibular osteotomies in rats were exposed to an extremely low frequency field for 14 days. By histologic evaluation it was found that the healing rate was retarded by the field. The effect (which was replicated) occurred at much lower power levels than are presently employed in electrical osteogenesis.

Spadaro JA, Becker RO, Function of implanted cathodes in electrode-induced bone growth, Medical & Biological Engineering & Computing, 1979 Nov;17(6):769-75, PMID: 317920

Spadaro JA, Webster DA, Becker RO, Silver polymethyl methacrylate antibacterial bone cement, Clinical Orthopedics and Related Research, 1979 Sep;(143):266-70, PMID: 509832

An improved antibacterial bone cement was sought based on the addition of low concentrations of inorganic silver compounds to polymethyl methacrylate. Composites with AgCl, Ag-AgCl, Ag₂O, Ag₂SO₄ and Ag₃PO₄ in concentrations of 0.05% to 1% by weight, were tested in vitro against bacterial cultures. All were effective, but Ag₂SO₄ was especially so, even after 7 weeks of incubation in normal saline. Compressive strength of the cement was not affected by these additions, except in the case of Ag₂O. Biocompatibility tests in rabbit muscle for up to 12 weeks

showed no significant difference between the Ag -PMM and plain PMM in tissue reactivity, both being minimal. These features, coupled with the broad spectrum of antibacterial activity and low allergic potential of silver, make Ag-PMM an attractive alternative to conventional organic antibiotic/bone cement composites.

Reichmanis M, Marino AA, Becker RO, Laplace plane analysis of impedance on the H meridian, *The American journal of Chinese medicine*, 1979 Summer;7(2):188-93, PMID: 484540

The AC impedance of a length of the H meridian not containing any acupuncture points was studied by means of Laplace plane analysis of the time domain response to an input voltage pulse. The ensuing frequency domain data were compared to the results of an identical analysis for two anatomically similar controls on either side of the meridian. The resistance of the meridian was significantly lower than either control.

Becker RO, The significance of electrically stimulated osteogenesis: more questions than answers, *Clinical Orthopedics and Related Research*, 1979 Jun;(141):266-74, PMID: 314373

The present technique of electrical osteogenesis represents the rediscovery of a method in clinical use over 100 years ago. That technique while reported to have excellent clinical results, was empirically applied and was totally discredited as having no scientific basis. Modern techniques report similarly useful clinical results, but similarly lack an accepted scientific basis. The techniques in present use differ so greatly among themselves that a common mechanism of action seems highly unlikely. Yet all report excellent clinical results. Serious questions are raised concerning the validity of the claims, the mechanism of action and the possibility of long-term undesirable side effects. These questions are not insoluble and the newer physical science disciplines seem well suited to reveal the mechanism of action. Appropriate research projects must be mounted and answers to these questions obtained before the technique is made available for wide application. The importance of this procedure far transcends orthopedic surgery and bone growth stimulation and if properly pursued, it may lead to revolutionary changes, not only in basic biology, but in the practice of clinical medicine in general.

Marino AA, Becker RO, Hart FX, Anders F Jr., Space osteoporosis: an electromagnetic hypothesis, *Aviation, space, and environmental medicine*, 1979 Apr;50(4):409-10, PMID: 464968

Loss of body calcium during spaceflight is a potential problem in long voyages. This loss does not appear to be caused by a deficiency in diet or exercise. The idea is advanced that the altered electromagnetic environment experienced in space may be at least partially responsible. We show that the electric field induced inside astronauts because of their motion in the geomagnetic field is greater than that which has produced a wide variety of biological effects in earth-bound experiments.

Reichmanis M, Perry FS, Marino AA, Becker RO, Relation between suicide and the electromagnetic field of overhead power lines, *Physiological chemistry and physics*, 1979;11(5):395-403, PMID: 542502

Laboratory studies have shown that electromagnetic fields similar to those from high-voltage transmission lines can produce biological effects. Surveys of the actual effects of such lines on exposed individuals usually have been hampered by complicating factors tending to blur the data. By means of a new approach, however, correlation has been established between the presence of transmission-line fields

and the occurrence of suicides in part of the Midlands of England.

Becker RO, Electrical Osteogenesis: Pros and cons, Calcified tissue research, 1978 Dec 8;26(2):93-7, PMID: 367538

Becker RO, Spadaro JA, Treatment of orthopaedic infections with electrically generated silver ions. A preliminary report, The Journal of bone and joint surgery (American volume), 1978 Oct;60(7):871-81, PMID: 701335

Electrically generated silver ions have been shown previously to be a potent antibacterial agent with an exceptionally broad spectrum as indicated by in vitro testing. The present study reports on clinical experience using electrically generated silver ions as adjunctive treatment in the management of chronic osteomyelitis. Fourteen patients had fifteen treatment attempts: thirteen for chronic osteomyelitis of the tibia, one for acute and chronic pyarthrosis and osteomyelitis of the knee, and one for a chronically draining sinus after total hip replacement. Wound débridement, silver ion iontophoresis, and subsequent wound care (usually provided by the patient) resulted in control of the infection in twelve of the fifteen treatment attempts and in healing of the non-union after follow-up ranging from three to thirty-six months. The other three attempts led to two partial and one complete failure.

Reichmanis M, Becker RO, Physiological effects of stimulation at acupuncture loci: a review, Comparative medicine East and West, 1978 Spring;6(1):67-73, PMID: 710080

Recent studies reporting significant physiological effects associated with electrical and manual stimulation at several traditional Chinese acupuncture loci are reviewed. Other reports on the anatomy and electrical properties (DC resistance and potential, AC impedance) of these sites indicate that many are significant local skin resistance minima and may also be points of locally more positive DC potential. Further investigation of the basic properties of the acupuncture system and its mode of action is fully warranted by these preliminary findings.

Dueland R, Hoffer RE, Selen WA, Becker RO, The effects of low voltage current on healing of thermal third degree wounds, The Cornell veterinarian, 1978 Jan;68(1):51-9, PMID: 303976

Bilateral third degree burns were created on the flanks of eight miniature swine. Each animal had one side treated daily with low intensity direct (LIDC) of 400 microamperes (muA) by contact electrode for 2 hours morning and afternoon until healing occurred. The polarity of the electrode was negative in 4 pigs and positive in 4 pigs. One group of 4 pigs had the eschar surgically removed 24 hours post burn. Weekly biopsies and cultures were taken of treated and control wounds. Results indicated: local treatment of 400 muA LIDC did not hasten or delay healing of thermal third degree burns; escharectomy hastened wound healing by 10 days, and superficial proteus infection occurred in 80% of all wounds.

Mitchell JT, Marino AA, Berger TJ, Becker RO, Effect of electrostatic fields on the chromosomes of Ehrlich ascites tumor cells exposed in vivo, Physiological chemistry and physics, 1978;10(1):79-85, PMID: 569338

An effect of electrostatic fields on the chromosomes of Ehrlich ascites tumor cells exposed in vivo has been demonstrated. Cells exposed to horizontal electrostatic fields for two weeks had almost a threefold increase in the percentage of abnormal chromosomes when compared to control cells or cells exposed to vertical electrostatic fields

for the same period. Extended exposure times of 4--15 weeks resulted in the disappearance of the aberrant chromosomes. It is suggested that the effected cells were incapable of cellular replication resulting eventually in their disappearance via cell death.

Marino AA, Becker RO, Hazard at a distance: effects of exposure to the electric and magnetic fields of high voltage transmission lines, Medical research engineering, 1977 Nov;12(5):6-9, PMID: 349303

Reichmanis M, Marino AA, Becker RO, Laplace plane analysis of impedance between acupuncture points H-3 and H-4, Comparative medicine East and West, 1977 Fall-Winter;5(3-4):289-95, PMID: 610979

The frequency dependence of the skin impedance between two acupuncture points (H-3 and H-4) was determined by Laplace plane analysis of the time domain response to an input voltage perturbation. Both the resistance and capacitance between the acupuncture points differed significantly from the corresponding controls, thus supporting the interpretation of the acupuncture system as an information transfer network.

Reichmanis M, Becker RO, Relief of experimentally-induced pain by stimulation at acupuncture loci: a review, Comparative medicine East and West, 1977 Fall-Winter;5(3-4):281-8, PMID: 610978

Reichmanis M, Marino AA, Becker RO, Laplace plane analysis of transient impedance between acupuncture points Li-4 and Li-12, IEEE transactions on bio-medical engineering, 1977 Jul;24(4):402-5, PMID: 881215

Becker RO, Spadaro JA, Marino AA, Clinical experiences with low intensity direct current stimulation of bone growth, Clinical Orthopedics and related research, 1977 May;(124):75-83, PMID: 304404

Low intensity direct current stimulation of bone growth involves the continuous application of cathodic currents in the nanoampere range. The technique has been applied to 13 patients with a variety of non-unions and pseudarthroses with a success rate of 77 per cent. Preliminary data indicate that a range of total energy, from 0.6 to 2.5 Joules, is maximally effective. The technique has been combined with anodic control of local bacterial infection with promising results. Both the osteogenic stimulation and the bacterial suppression techniques as described in this paper, appear to be safe and effective.

Marino AA, Becker RO, Electrical osteogenesis: an analysis, Clinical Orthopedics and related research, 1977 Mar-Apr;(123):280-2, PMID: 852183

Marino AA, Berger TJ, Austin BP, Becker RO, Hart FX, In vivo bioelectrochemical changes associated with exposure to extremely low frequency electric fields, Physiological chemistry and physics, 1977;9(4-5):433-41, PMID: 613333

One hundred seventy-four 21- to 24-day-old Sprague-Dawley rats were continuously exposed to a 60 Hz electric field of 150 V/cm for one month in ten separate experiments. Biological effects observed included depressed body weights, serum corticoids, and water consumption. The findings are tentatively interpreted as indicating that a power frequency electric field is a biological stressor. The observed effects cannot be a consequence of Joule heating and therefore indicate that electric fields can influence biological systems either at the systemic level, or at the

cellular level via electrochemical alteration of the microenvironment.

Marino AA, Becker RO, Biological effects of extremely low frequency electric and magnetic fields: a review, *Physiological chemistry and physics*, 1977;9(2):131-47, PMID: 414240

Berger TJ, Spadaro JA, Bierman R, Chapin SE, Becker RO, Antifungal properties of electrically generated metallic ions, *Antimicrobial agents and chemotherapy*, 1976 Nov;10(5):856-60, PMID: 1034467, PMCID: PMC429848

A qualitative and quantitative investigation was undertaken to study the susceptibility of unicellular eucaryotic organisms (yeasts) to metallic cations generated by low levels of direct current. Results were characteristic of effects obtained previously using clinical and standard bacteria test organisms. The present study demonstrated that anodic silver (Ag(+)) at low direct currents had inhibitory and fungicidal properties. Broth dilution susceptibility tests were made on several species of *Candida* and one species of *Torulopsis*. Growth in all isolates was inhibited by concentrations of electrically generated silver ions between 0.5 and 4.7 mug/ml, and silver exhibited fungicidal properties at concentrations as low as 1.9 mug/ml. The inhibitory and fungicidal concentrations of electrically generated silver ions are lower than those reported for other silver compounds.

Fuller RG, Marino AA, Becker RO, Photoconductivity in bone and tendon, *Biophysical journal*, 1976 Jul;16(7):845-6, PMID: 938723, PMCID: PMC1334905

Ultraviolet light can be used to stimulate electrical current flow in bone and tendon. This stimulated photocurrent is directional. In tendon the photocurrent parallel to the fibrils is greater than the photocurrent perpendicular to the fibrils. In bone, the longitudinal photocurrent is less than the transverse photocurrent.

Marino AA, Becker RO, Ullrich B, The effect of continuous exposure to low frequency electric fields on three generations of mice: a pilot study., *Experientia*, 1976 May 15;32(5):565-6, PMID: 1278293

Mice were allowed to mate, gestate, deliver and rear their offspring for 3 successive generations while being continuously exposed to 60 Hz electric fields. Mice exposed to vertical electric fields exhibited decreased body weights at 35 days postpartum and increased mortality rates for 3 successive generations. Mice exposed to horizontal electric fields exhibited decreased body weights for 2 successive generations.

Reichmanis M, Marino AA, Becker RO, D.C. skin conductance variation at acupuncture loci, *The American journal of Chinese medicine*, 1976 Spring;4(1):69-72, PMID: 1266803

Skin conductance was measured in 10 subjects with a DC Wheatstone bridge in 10 areas purportedly containing acupuncture loci on the Triple Burner (TB) and Lung (Lu) meridians. When the results were compared to those from anatomically similar locations devoid of acupuncture loci, local conductance variation was found to be significantly different (p less than 0.05) in most acupuncture locus locations.

Berger TJ, Spadaro JA, Chapin SE, Becker RO, Electrically generated silver ions: quantitative effects on bacterial and mammalian cells, *Antimicrobial agents and chemotherapy*, 1976 Feb;9(2):357-8, PMID: 944551

The inhibitory and bactericidal concentrations of electrically generated silver ions were 10 to 100 times lower than for silver sulfadiazine. Effects on normal mammalian cells were minimal.

Reichmanis M, Marino AA, Becker RO, Electrical correlates of acupuncture points, IEEE transactions on bio-medical engineering, 1975 Nov;22(6):533-5, PMID: 1184029

Marino AA, Becker RO, Piezoelectricity in hydrated frozen bone and tendon. Nature, 1974 Nov 15;30(11):1274-5, PMID: 4140104

Spadaro JA, Berger TJ, Barranco SD, Chapin SE, Becker RO, Antibacterial effects of silver electrodes with weak direct current, Antimicrobial agents and chemotherapy, 1974 Nov;6(5):637-42, PMID: 15825319, PMCID: PMC444706

Silver, platinum, gold, stainless-steel, and copper electrodes were used with low currents (0.02 to 20 μ A/mm²) to explore their electrochemical effects on the growth of four bacterial species. In the higher current ranges, all electrodes inhibited growth at both poles, usually in conjunction with electrolytic break-down of the medium and severe corrosion of the metal. Silver, however, was extremely bacteriostatic, even at the lowest current, when used as the anode. Quantitative studies showed that most of this inhibition takes place in a few hours and is not accompanied by changes in pH. Electrochemically injected silver from the anode is probably the instrumental agent, being effective in concentrations of about 5 μ g/ml. This is the equivalent concentration of silver sulfadiazine that has been shown to give complete inhibition of bacteria, but without the sulfonamide moiety.

Marino AA, Berger TJ, Becker RO, Spadaro JA, The effect of selected metals on marrow cells in culture, Chemico-biological interactions, 1974 Sep;9(3):217-23, PMID: 4426110

Baker B, Becker RO, Spadaro J, A study of electrochemical enhancement of articular cartilage repair, Clinical Orthopaedics and Related Research, 1974 Jul-Aug; (102):251-67, PMID: 4425033

Marino AA, Becker RO, Piezoelectricity in bone as a function of age, Calcified tissue research, 1974 May 28;14(4):327-31, PMID: 4527112

Barranco SD, Spadaro JA, Berger TJ, Becker RO, In vitro effect of weak direct current on Staphylococcus aureus, Clinical orthopaedics and related research, 1974 May; (100):250-5., PMID: 4838406

Marino AA, Becker RO, Piezoelectricity and autoinduction, Clinical orthopaedics and related research, 1974 May; (100):247-9, PMID: 4838405

Becker RO, Chapin S, Sherry R, Regeneration of the ventricular myocardium in amphibians, Nature, 1974 Mar 8;248(444):145-7, PMID: 4818918

Bassett CA, Becker RO, Brighton CT, Lavine L, Rowley BA, Panel discussion: To what extent can electrical stimulation be used in the treatment of human disorders?, Annals of the New York Academy of Sciences, 1974;238:586-93, PMID: 4548340