BIOMAGNETIC HEALING

by Gary Null

tomado de: http://www.garynull.com/documents/magnets.htm

This paper presents the issues and scientific research relating to the efficacy of Biomagnetic Healing. For additional information on this controversial topic, read Gary Null's book, Healing with Magnets, which includes clinician's reports and actual patients' experiences.

Note: The information on this website is not a substitute for diagnosis and treatment by a qualified, licensed professional.

CONTENTS

INTRODUCTION

The power of the magnet is one of the most basic powers in nature. We know that magnetism itself was an ingredient in the primordial soup from which the universe and our planet came forth. Magnetism is the force that keeps order in the galaxy, allowing stars and planets to spin at significant velocities. And in a sense, our own planet's magnetic field is responsible for protecting all life on earth.

This book is about how we can use the power of magnetism to optimize health. Today, we are at an exciting juncture in the evolution of health care as biomagnetic therapy fast becomes one of the most promising new therapeutic interventions. Actually, biomagnetic therapy is not new to everyone. Many veterinarians have been aware of biomagnetic benefits for years, and use magnets to heal fractures quickly, thereby saving the lives of race horses and other animals. Doctors treating professional athletes commonly recommend magnets to speed up recovery from painful injuries. And other

physicians in a variety of specialties, including dermatologists, internists, pediatricians, and surgeons, are seeing excellent results as well.

That magnetic healing is nothing new can be seen by looking at early records of scientifically advanced civilizations, which tell us that magnetic forces have long been prized for their restorative properties. Ancient Greece discovered the very first natural magnet in the form of the lodestone, and Hippocrates, the father of medicine, noted its healing powers. The Egyptians, too, described the divine powers of the magnet in their writings, and Cleopatra frequently adorned herself with magnetic jewelry to preserve youthfulness. Chinese manuscripts dating back thousands of years describe the Eastern belief that the life force, termed "qi", is generated by the earth's magnetic field. Today, many believe that certain places on earth, such as Lourdes, France, and Sedona, Arizona, owe their healing powers to naturally high levels of this qi, or biomagnetic energy.

It should be noted that today, magnetic therapy is well established in other countries, such as Japan, China, India, Austria, and Germany. In the U.S., unfortunately, many healing techniques readily accepted by other traditions are only familiar to those practitioners on the cutting edge. Although state-of-the-art American medicine uses techniques to monitor magnetic fields, such as electrocardiograms, electroencephalograms, and magnetic resonance imaging, it has not taken other forms of magnetic therapy seriously. More and more American studies, however, are confirming the value of the magnetic approach. As a result, magnet therapy is gaining credibility in the U.S. and being applied by increasing numbers of doctors and other health practitioners to treat a wide range of ailments. Now awareness of this modality is filtering down to the general public, as increasing numbers of people are sleeping on magnetic beds at night and wearing small magnets during the day for greater energy, preventive purposes, and healing. It is with the idea of expanding this awareness of a natural healing option that I have interviewed a wide range of clinicians, scientists, and patients, and written this book.

Finally, no one claims that magnetic therapy is going to work for everyone. However, ample evidence suggests that seven out of ten people experience a beneficial effect. One is led to ponder if when Hippocrates wrote, "The natural force within each of us is that greatest healer of all," he did not have magnetic energy in mind.

ISSUES IN MAGNET THERAPY

Research into magnet therapy is divided into two distinct areas: pulsed bioelectric magnetic therapy and fixed magnetic therapy. Probably 85 to 90 percent of the scientific literature is on pulsed bioelectric biomagnetic therapy; the remainder is on therapy with fixed solid magnets. As is always the case, research interest and funding have been where there is proprietary gain. No patents can be issued for work done on fixed magnets, but certainly they can be for pulsed magnetic devices. Since it cannot necessarily be assumed that a positive result from pulsed bioelectric magnets will automatically translate to a positive result from a fixed magnet, there needs to be more study in the area of fixed magnets.

Another reality of this still developing field is that there are different schools of thought on the essential mechanisms of magnetic therapy, centered on questions of polarity,

among other issues. In this book I have tried to draw on the input of the most responsible scientific and medical representatives from varying points of view. These are not lay marketeers passing along misinformation. Rather, these sources are qualified M.D., Ph.D. research scientists and clinicians who have spent years in the field.

One is Dr. William Pawluk*, of Chicago, a board-certified family physician in both Canada and the United States and Assistant Professor in the School of Hygiene and Public Health and School of Medicine at Johns Hopkins University. Dr. Pawluk*, who is vice president of the North American Academy of Magnetic Therapy, lectures extensively on magnetism and combines magnetic therapy and acupuncture in his practice. He has written a chapter on magnetic therapy for the Textbook of Complementary Medicine (Williams & Wilkins, Baltimore) and has undertaken the noble task of studying and translating a comprehensive body of foreign research on magnetism and its applications.

Another perspective comes from John Zimmerman, Ph.D., one of the leading authorities in America on the subject of magnets. He is president of the Bio-Electro-Magnetics Institute, an independent, nonprofit, educational, research organization dedicated to furthering our understanding of bioelectromagnetism. Dr. Zimmerman has published extensively and is currently conducting a double-blind, placebo-controlled study on the effectiveness of fixed magnets for low back pain. He is also a member of the North American Academy of Magnetic Therapy.

On some points the two main schools of thought think alike. They generally agree in their discussion of size, strength, and placement of magnets, and duration of treatment. Where they disagree is at the basic physics level regarding when to use a positive or a negative pole. There is also some confusion, as we shall see, about the correct labeling of poles on magnets. But controversy is par for the course in a developing field, and irrespective of which school is ultimately found right, each has enough positive clinical, anecdotal, and scientific results to show that magnets work.

Magnetism and Electromagnetism

What is the difference between a fixed magnet and an electromagnetic device? Simply put, a fixed magnet emits a magnetic field, while an electromagnetic apparatus gives off an electric and magnetic field. Dr. John Zimmerman elaborates: "Magnetism and electromagnetism are different sides of the same coin. However, unlike a coin, electromagnetism has three sides rather than two. They are the electric field, the magnetic field, and the electromagnetic radiation.

"Electric fields are associated with the displacement of charged particles, usually electrons, but sometimes charged particles called ions. An example of an electric field occurs when you shuffle your feet across a carpet and touch a doorknob. The carpet pulls some electrons from your body and your clothing, leaving you with a deficiency and the carpet with an excess. When you touch the doorknob, it pulls up electrons to satisfy your deficiency, and it balances the electrical charge, creating a spark in the process. Electrical fields are measured in units called volts per meter (vpm) or volts per centimeter (vpc).

"The next side of the three-sided coin is the magnetic field. A magnetic field is caused by electrical charges in motion, as opposed to an electric field, which is produced by electrical charges in different concentrations, more in one place than the other, regardless of whether or not they are moving. You cannot see the electrical current in a magnet; you have to delve deeper into the structure of matter to understand.

"In a static magnet, the electrical current moves in terms of electrons orbiting around the atomic nuclei. An iron body is magnetized when the electrons become aligned to a greater degree."

Zimmerman goes on to explain that the best way to describe magnetism in a permanent magnet is to make an analogy with the military: "Imagine all the atoms in an unmagnetized block of iron to be soldiers in a barracks going about their daily business. Some may be brushing their teeth, while others read magazines, and others lie in bed. Then, the captain walks in, and the drill sergeant says, 'Fall in.' Everybody scrambles to fall in place, aligning themselves in the same direction with a certain amount of space between them. The difference before and after the command 'Fall in' is analogous to the difference between an unmagnetized block of iron before and after being subjected to a magnetizing force. The magnetizing force commands electrons, and the atoms in the block of material literally fall into place. Once they become aligned in the same direction, you have a permanent magnet."

Magnetism can also be produced by currents in a wire, Zimmerman continues, and these magnetic fields are due to the electrons in the wire. "If it's a 60 cycle per second (cps) current, like a wall outlet, electrons shuffle back and forth, creating 60 full cps. But they really don't go anywhere. They're like the tide going in and out of the ocean, going first in one direction and then the other. But the tide really never goes anywhere outside of that predetermined length of run. Electrons in a wire, in a lamp cord, or in a power line, are very similar. They'll basically go back and forth, producing a magnetic field in the area around it."

How does this differ from electromagnetic radiation? This is the third side of the coin, Zimmerman explains. "EMR occurs when you have charges that accelerate or decelerate very quickly. Imagine a glass of water filled almost to the very top. You slowly dip a spoon into and out of the water, and every time you change direction, you accelerate the motion of the spoon. If the rate of that acceleration and deceleration is relatively slow, you can dip the spoon in and out of the nearly full glass of water all day long, and not much will happen. The water will stick to the spoon, and when you pull the spoon out of the water, it will have some water droplets adhere to it. When you put it back in, it will go back into the glass of water.

"What happens, though, if you start to accelerate the motion of that spoon? Obviously, water is going to start flying off of it. This is exactly what happens when you produce EMR. At a certain rate of change of velocity that is analogous to moving a spoon into and out of the water very quickly, charged particles, called photons, come off of the source of the moving electric charges, much like water droplets coming off of the spoon that's rapidly moving in and out of the glass of water. Photons, noncharged massless entities which carry the electromagnetic force across space, are frequently pulled off of the charged couriers, much like water droplets coming off the spoon being rapidly lowered into and raised from a glass of water. This is what we refer to as EMR." As the

name implies, electromagnetic radiation contains two distinct fields: an electric field, measured in volts per meter or volts per centimeter, and a magnetic field, which is measured in units called teslas, or gauss. (One tesla equals 10,000 gauss.)

The effectiveness of using pulsed magnetic fields to heal bone fractures and, to a lesser degree, soft tissue injures such as sprains and strains, is quite well documented. Numerous scientific journals have reported these findings since the 1970s, and the FDA approves the use of pulsed electromagnetic fields for the treatment of nonunion bone fractures, which are fractures that will not heal on their own. It is believed that the pulsed electromagnetic fields penetrate the cast and get to the layer of skin that's moist and conductive. Then the electric field stops, but the magnetic field continues to do the healing work.

Clinical experience suggests other uses for electromagnetic devices. Hundreds of articles substantiate claims of benefit for a large number of conditions, including osteoarthritis, rheumatoid arthritis, fibromyalgia, tension headaches, migraines, and Parkinson's disease.

Fixed magnets are believed to help these conditions, as well as others, and are generally more economical and less complicated to use. Doctors have presented papers at the North American Academy of Magnetic Therapy, citing success with fixed magnets in patients with congestive heart failure and various types of cancerous conditions. A Canadian research project is investigating the effects of fixed magnets on fibromyalgia; specifically, the researchers want to determine whether sleeping on a magnetic pad helps to reduce the pain associated with the condition. Rheumatoid and osteoarthritis have been reported to respond very well to magnetic field therapy using fixed individual magnets.

The Polar Controversies

If you are looking for confusion, controversy, and contradictions, you might want to follow politics, or better yet, you might want to look into the questions surrounding the naming of magnetic poles. For instance, is the south pole true south? And is the north pole true north? How a magnetic pole is named is dependent upon convention, and not all conventions are alike. Therefore, you may be getting two magnets from two companies where corresponding sides are called north on one magnet and south on the other. Dr. Zimmerman explains: "We need to understand that there are two ways of naming the north pole of the magnet: convention one and convention two. You have to know which convention you're dealing with. Otherwise, what you're calling north somebody else may be calling south.

"Way one of naming the poles of the magnet is called the traditional, scientific, sailor navigation type of way. It assumes that if you suspend a bar magnet on a pivot point, like a compass needle, or maybe on a string from the ceiling, the part of the magnet that points north is labeled the north pole of the magnet, and obviously that end of the magnet that points geographically south is the south pole of the magnet." Zimmerman says that this traditional way of naming the poles is not the one used by most people employing biomagnetic therapy.

"In the biomagnetic nomenclature of identifying the poles of the magnet, it's just the opposite," Zimmerman explains. "That end of the magnet that points north is labeled the south pole because it's attracted to the north pole of the earth. That end of the magnet that attracts the south pole of the earth is labeled the north pole of the magnet because opposites attract."

Zimmerman goes on: "People might say, 'Gee, in the traditional way of naming magnets, how can the north pole be pointing north?' The answer uses rather complex reasoning. I don't mean to confuse people, but in the traditional way of naming the poles of the magnet, the reason the north pole of the magnet points north is that the traditionalists assume that the south magnetic pole of the earth is located in the northern hemisphere. That sounds backwards, complex, and confusing, and it is. But that's the way traditional science textbooks and physics textbooks often get around the conundrum that the north pole of the magnet is pointing north. They say that the south pole is located in the northern hemisphere.

"That's all very confusing to people, so we like to focus our attention on what we call the biomagnetic definition, which avoids that complexity. It assumes that the north pole of the magnet is where it's supposed to be--in the geographic north pole of the earth, and the south pole is in the southern hemisphere. With this definition, a suspended bar magnet, or the arrowhead of a compass needle that points north, is always the south end of the magnet or the south end of the compass needle. Stated another way, if you have a magnet that is flat, and you want to know which end is north, approach it with a compass needle. That end of the magnet that attracts the arrowhead of the compass needle is the biomagnetic north pole."

Another controversy revolves around the issue of when to use the north, or negative, pole and when to use the south, or positive. One school of thought is based on the ideas of Davis and Rawls, whose studies done in the 1930s suggest that exposure to biomagnetic negative poles enhance health, while biomagnetic positive poles exacerbate disease. More recently, Dr. William Philpott has been championing the Davis and Rawls point of view and drawing conclusions based upon his own clinical experience. Here is what Philpott feels each pole will do:

North (Negative) Pole

- Relieves pain
- Reduces swelling
- Promotes tissue alkalinization
- Promotes sound, restful sleep
- Increases tissue oxygenation
- Calms the nervous system
- Assists in relief of addictive tendencies

South (Positive) Pole

- Accelerates growth indiscriminately
- Increases swelling
- Promotes tissue acidity
- Decreases tissue oxygenation

- Makes sleep less sound and restful
- Promotes anxiety

There are those who support the claims of Philpott. Yet, scientists wishing to duplicate the work of Davis and Rawls cannot find any data to work from. And a search of the literature shows Philpott to be making more claims than scientific evidence can support at this time. Philpott also promotes his own magnets and may therefore be biased. This is not to say that these claims are false; however, more scientific research confirming or disproving these claims needs to be done.

The only study to date on this issue was published in the September 1990 issue of the "Journal of the National Medical Association." Scientists took petri dishes full of cancer cells and put them in either the biomagnetic north pole end of a magnetic resonance imaging facility or the biomagnetic south pole end. In three weeks, the petri dishes in the north pole end exhibited a dramatic decrease in cell growth, which is what you what you want to see with cancer cells. The dishes in the south end exhibited a slight, but detectable, increase in the rate of cell growth. This is the first experiment to address this question, and more work is clearly needed.

To add confusion to the issue, some scientists believe that there is no strong evidence supporting the use of one pole over another. This point of view is especially prevalent in Russia. Japanese manufacturers who uphold this point of view sell magnetic mattress pads that expose the body to both north and south fields, although some experts have warned against this practice.

Dr. Zimmerman is currently studying the difference between unipolar and bipolar magnets in the treatment of low back pain. The unipolar magnets have flat surfaces and expose the subject to just one field, while bipolar magnets expose the skin to both fields simultaneously. They are designed with alternating spatial patterns of north and south poles, so they may be arranged, for example, as concentric circles, like a target, as alternating squares, analogous to a checkerboard, or as alternating triangles. Both types of magnets have their proponents, and Dr. Zimmerman is seeking to address the issue from a scientific point of view rather than be influenced by manufacturers' advertising.

An argument against the north/south dichotomy is made by Dr. Pawluk*, who says that there is no proof that magnet wearers are being exposed to just one polarity. Pawluk questions the existence of a purely north or south field as he talks about the impossibility of the "blocked wall concept": "The problem with the 'blocked wall' is that in a magnetic field, molecules line up perfectly and produce lines of force that are very strong in one direction. The lines of force bend around and then turn back on themselves. You have one molecule on one side that's lined up in one direction and one molecule on the other side lined up in the opposite direction. When they bend around, they cancel each other out.

"Let's assume the upper part of the magnet is the north pole," Pawluk* continues. "Then the bottom part will be the south pole. At the top part, the lines of force are north pole lines. In physics, I'm not sure anyone can make a distinction between a line of force coming out of the upper side or north side of the magnet versus the line of force that's coming from the south side. It's not like cold and hot water. There's no scientific evidence proving that they are different. If you move away from the edge of the magnet

by an inch or half an inch, and you measure the area with a magnetometer, you'll find that the field has changed from positive to negative. Say the top surface is positive. If you move one inch to the side, you'll find, when you measure the area with a magnetometer, that the field has changed and become negative. It goes from a north to a south pole. What that means is that at any given time with a permanent magnet you are actually being exposed to both the north and south pole. When you have a very dense magnet there's obviously a higher concentration of south pole at the surface than there is at the sides. Nevertheless, you're actually being exposed to both fields."

In summation, Dr. Pawluk* explains that most scientists now believe that permanent magnets create their effects because of the drop in the field, or what is known as the gradient. The change in polarity may be what is producing the effect in the body. In other words, both north and south poles are entering the body at any given moment, and the entirety of the magnet is what is doing the healing.

HOW MAGNETS ARE USED

While very little research on magnet therapy has been done in the United States, there has been a lot of work in this field in Russia, Czechoslovakia, and the Western European nations over the past 30 years. This discrepancy parallels an experience I had about 15 years ago when I approached the FDA to see what information they had concerning glandular implants as a way of rejuvenating body systems. They said there had not been a single study done and that it was quackery. A quick review of the American literature did suggest there was never a study done in the United States. But after going to Vienna, Austria, as well as to Heidelberg, Germany, and interviewing scientists and clinicians working in the field of glandular implants, I was provided with over 500 studies published in the peer-reviewed literature. Similarly, if you look for research on fixed magnets in the United States, you will find a paucity and think there is a minimum of hard evidence. However, if you were to go to Russia, where magnetism is a well-regarded and highly respected science, you'd find hundreds of studies on fixed and pulsed magnetic therapy. It is rare for an American physicist to read Russian, and hence review their literature. But Dr. William Pawluk* has done just that and shares his views in our Clinicians' Reports section, showing that there is more than adequate reason to feel very positive and assured about the nature of this research.

Even if you do not have access to the research, magnets are simple to use. So, why not give them a try? My suggestion would be to use magnets on yourself as if you were performing a single controlled study. Listen to what your body tells you. If you have had unremitting arthritis pain in your hands and apply a magnet to it, you may find that three days later you no longer have pain for the first time in 10 years. Remember, your own experience is valid. This book is an effort to combine practical common-sense usage and good clinical experience. Science will simply have to catch up.

A Complementary Therapy

Of course nobody is saying that magnets are a be-all and cure-all. They should not be used by themselves for any major disease or medical condition, but rather, they should be looked upon as an adjunctive therapy. My own personal experience is that magnets work best in combination with other healing modalities. Ever since seventh grade, I have been a competitive athlete, winning dozens of USA track and field national

championships, regional championships, and over 300 local races. And I have set numerous American records. Therefore, I know my body well. When I sustained a severe hamstring injury, I used magnets--small, medium, and large, from 500 gauss to 5000 gauss--wearing them for 15 minutes at a time and sleeping with them taped to my leg. The magnets hastened my recovery.

A year and a half later, I reinjured the same hamstring. This time, I used magnets in addition to intravenous vitamin C drips, glutathione, calcium, magnesium, quercetin, and other nutrients at very high dosages. The first hamstring injury required almost three months to heal using magnets alone; the reinjury required two weeks to heal. I have seen the same results throughout my career when multiple therapies were used instead of an individual one. Hence, I believe that magnets should be used in combination with other healing modalities, which may include therapeutic touch, acupuncture, acupressure, deep or soft tissue massage, and compresses, to name just some of the approaches available.

Warnings

While magnets are generally safe, there are times when they should not be used. Here are some caveats to keep in mind:

Pregnancy Until research proves otherwise, pregnant women should not wear magnets, particularly over the abdominal area, which would expose the fetus to the magnetic fields. Using magnets on the shoulder, arm, or elbow, however, would not expose the fetus and would be allowable.

Pacemakers Individuals wearing heart pacemakers or other electronic implanted devices should not use magnets near the apparatus. A magnet should not be suspended over the heart, for instance. Nor should they be worn on the mid-back where the magnetic field affects the heart from the opposite side. It is all right, though, to wear magnetic insoles for sore, tired feed, or a magnetic pad on the elbow, knee, or ankle.

Bleeding Wounds Magnets lessen the stickiness of platelets, blood components that make a scab after you cut yourself. So, if you use a magnet when you have an active bleeding wound, you may actually increase the amount of bleeding in the wound. It's best, then, to wait until the wound gets sticky or starts to show evidence of healing. Apply magnets at that point. Definitely do not use magnets if you are on anticoagulants or if you have a condition, called polycythemia, that increases the likelihood of bleeding.

Bipolar Magnets for Those with Infections and Cancer People with cancer or any sort of infection, like candida, fungi, viruses, or bacteria, should avoid exposure to bipolar magnets. As we've mentioned, many believe from their observations and clinical experiences that the south pole accelerates the growth of cancer cells, bacteria, viruses, and fungi. Not all practitioners and manufacturers agree, but until the research proves otherwise, it is prudent to err on the side of caution, and only use products with north-facing magnetic fields.

Considerations When Using Fixed Magnets

The effectiveness of magnetic treatment depends largely on four factors, according to Dr. John Zimmerman: strength, thickness, number of magnets used, and spacing.

First, magnets vary in strength, and it's important to remember that stronger magnets penetrate more deeply than do weak ones and that the reading at the surface of the magnet is different from the reading at its core. In other words, a magnet that is a 2000 gauss at its core may only be 200 gauss at its surface. If the problem area is covered by a thick layer of skin--say, at the thigh--the magnet may not be able to penetrate deeply enough to make a real difference. A strong, thick magnet will be needed. To penetrate 4 inches, one needs a 300-gauss magnetic field, and to get that strength, one may need a magnet of about 8000 or 10,000 gauss at its surface. These are hard to find but can sometimes be purchased through commercial distributors.

Neodymium and ceramic magnets tend to be more powerful than the plastalloy type. In general, the magnets that people should be purchasing are unipolar. They are flat-surface magnets that are magnetized along the direction of the surface. Note that horseshoe and bar magnets are not suitable for therapeutic application as they are magnetized on both ends or at the ends of the U-shape. Commonly, the magnets used therapeutically are either circular or rectangular. Several can be stacked for increased gauss strength and, therefore, greater effectiveness.

The thicker the magnet, the greater the depth of penetration. The down side to this is that, with increasing thickness, the magnet becomes more uncomfortable to wear. As a compromise one can wear magnets between 1/4 and 3/8 of an inch thick.

Manufacturers often stack a number of magnets closely together in the same direction. The more magnets that a manufacturer includes in its product, the stronger the magnetic field and the greater the depth of penetration.

The final factor in magnet effectiveness has to do with the thickness or spacing of the pad between the magnet and the skin's surface. Usually, this space is pretty small--about an eighth or a quarter of an inch. This spacing makes the magnet more comfortable to wear and also smooths out the bumpiness of the magnetic field.

Dr. Zimmerman explains: "There's a phenomenon called south pole bleed-through. If you have a magnet that's a standard 3/8 of an inch thick by 7/8 of an inch wide by 1-7/8 inches tall, on one side of the magnet you have the north pole, and on the other side you have the south pole across the surface, 7/8 x 1-7/8 inches. For round figures' sake, we'll call it 1 x 2. Across this 1 x 2 inch magnet, one side is north and the other is south. If you take a sensitive magnetometer, and you hold it against the north side, you will read north everywhere along the surface of that magnet until you reach the very edge. At the edge of the magnet, you'll start seeing south pole. That's called south pole bleed-through. Relatively few magnet manufacturers realize this.

"The way to avoid south pole bleed-through has to do with an interaction between this number and the spacing of the magnets and the thickness of the pad between you and the magnet. If you have relatively few magnets spaced far apart--say 12 magnets spaced two inches apart--then you must have a thickness of some substantial amount, say two or three inches, before the magnetic field will become uniform. If you have a dozen magnets in a 3 x 4 array, in between each individual magnet you'll see the south pole. If

you move a distance away from the magnet, say two or three inches, all the measured polarity will be north. There will be no south pole bleed-through. But if the magnets are spaced two inches apart, the thickness of the spacer must be rather substantial, say two, three, or four inches, to avoid south pole bleed-through. That makes the magnets much weaker, and it makes the pad uncomfortably thick. To avoid that, you can place the magnets much closer together. Instead of two inches apart, you can place them half an inch apart. Of course, if you space the magnets half an inch apart, you have to have more magnets. So, instead of having one dozen magnets, you might have three or four dozen. This increases the weight and the cost of the product, but the advantage is that it allows you to use a much thinner pad. In sum, if you space the magnets a certain distance apart, and you have a certain thickness of pad between you and the magnets, you'll get an entirely uniform north pole field."

Zimmerman goes on to say that because of south pole bleed-through, you want the magnet to be larger than the size of the area being treated. So while if you are treating a finger joint for arthritis, a small magnet is needed, if you are treating a large area, like the abdomen, a much larger magnet is called for.

There are more than two dozen magnet manufacturers (see Resources section). Dr. Zimmerman recommends a company in Deer Park, Washington, called Tengam, as an inexpensive source. He also suggests making an agreement with the seller of the magnet to offer a money-back guarantee if substantial relief is not obtained within 30 days. Reputable companies are likely to make and stand behind such an offer.

Therapeutic Uses

Magnets have been used therapeutically to relieve pain and discomfort for thousands of years, perhaps even longer than acupuncture, which is over 2000 years old. The first reported therapeutic use of magnets involved the grinding up of a naturally occurring material called magnetite and the application of this in poultice form to uncomfortable areas of the body.

Magnetite makes for a relatively weak magnet by today's standards. But since the earth's naturally occurring magnetic field was far higher in the past (2 to 3 gauss as opposed to 1/2 gauss today), magnetite crystals may have been stronger at one point in time. Still, this is a weak field by today's standards as one can easily buy a magnet with an internal gauss strength of 10,000 (1 tesla) or more. Such high exposures do not appear in any way detrimental; at worst, they seem harmless and at best they appear to help a variety of conditions.

Exposure to the earth's magnetic field plays an essential role in our health, a fact clearly demonstrated when the first astronauts returned to earth sick. Their illness was soon attributed to a lack of magnetism in outer space and the problem was subsequently resolved when NASA placed magnets in their space suits and spaceships.

It has since been discovered that in the absence of a magnetic field, the energy level of atoms diminishes. Necessary nutrients become depolarized and unusable. If this condition is permitted to continue, the body can become imbalanced and function improperly. By restoring balance to an organism, biomagnetic therapy can alleviate a

number of health conditions. Some of the most common applications of magnets are described below:

General Uses

Relief from Pain and Discomfort The most common use of magnetic fields is in the treatment of pain, with reports of successful treatment in a wide variety of conditions, including arthritis, rheumatism, fibromyalgia, back pain, headaches, muscle sprains and strains, joint pain, tendonitis, shoulder pain, carpal tunnel syndrome, and torn ligaments.

A noteworthy American double-blind, placebo-controlled study on the effects of static magnets on the treatment of arthritis was recently published in the ®MDBR¯ Journal of Rheumatology®MDNM¯ (November 1997, p. 1200). The study confirms the effectiveness of magnets in relieving the pain of arthritis. Another scientific study of similar rigor is being carried out by Dr. Zimmerman, and is looking at the effects of fixed magnets on low back pain. There is good reason to expect confirmation of what users have been claiming for years--that magnets are an excellent aid to pain relief.

To understand how magnets work to alleviate pain, it may help to look at pain mechanisms in the body. Pain is transmitted along nerve cells as an electric signal. While quiescent, the nerve has a small charge of about -70 mV. A pain signal depolarizes a cell. Magnets appear to raise the depolarization potential of the cell so that the signal is blocked from depolarization, in effect, blocking the pain. Furthermore, the ability of the nerve to send pain is slowed by a magnetic field. These phenomena can aid in the relief of pain throughout the body.

Pain relief may be enhanced when a magnet's negative pole is placed over certain acupuncture meridians. Research and clinical experience show that magnets increase energy (qi) along these points. The combination of therapies works synergistically so that their combined effects are greater than the sum of their effects would be if they were used separately. In addition, acupuncturists like magnets because they are painless and allow the treatment to continue long after a visit.

Reduction of Inflammation and Improved Circulation. Injured tissue emits a positive charge; placing the negative pole of a magnet over the area appears to restore a natural balance in the following way: The magnet improves circulation, allowing blood vessels to dilate and bring a greater volume of blood flow to the injured area. This helps to bring in natural healers and to remove the toxic byproducts of inflammation--bradykinens, prostaglandins, and histamines--all of which contribute to inflammation and pain. Thus, pain and inflammation are diminished and tissue healing is stimulated.

Antimicrobial Effects Magnetic therapy can help the body ward off such microbial invaders as viruses, bacteria, and fungi. It achieves this, in part, by increasing immune function through the oxygenation of white corpuscles, an important part of the immune system's arsenal.

A magnetic field can also function like an antibiotic by lowering acidity, with the result that microorganisms have a more difficult time surviving. In addition, hormonal production is regulated, altering enzymatic activity and biochemical messengers of the

immune system. For example, the pineal gland is one large electromagnetic entity. The net effect is to augment the body's natural ability to resist a variety of germs.

Stress Reduction The recent discovery of magnetite in the cells of the brain helps explain the calming effect of biomagnetic therapy. A magnetic field applied to the head calms as well as induces a hypnotic sleeping effect on the brain by stimulating the hormone melatonin. Melatonin is known to be anti-stressful, producing a sedating effect in insomniacs. This finding has led to the manufacture of magnetic pillows and pads designed to provide a sound and restful sleep. A person can then awaken with more energy and fewer aches and pains.

Correction of Central Nervous System Disorders Dr. William Philpott claims that biomagnetic therapy can help central nervous system disorders. He states that such symptoms as hallucinations, delusions, seizures, and panic can be alleviated through biomagnetic therapy without disrupting the patient's mental alertness and orientation. Also, a magnetic field may reduce the need for tranquilizers and antidepressants. Magnets have been used as well to stop epileptic seizures.

Energy Enhancement Biomagnetic therapy is known to increase general well-being by enhancing energy. The normal polarization of a positively charged nucleus with a negatively charged outer membrane permits a cell to function as a healthy entity. However, as the cell performs its daily functions, it becomes depolarized. Depolarized cells equal a tired person. It is believed that magnetic energy has the ability to penetrate all facets of the human body and reach every cell. That translates to greater energy and vitality throughout the body as a whole. Consequently, supplemental biomagnetic therapy can help the body revitalize.

One normally revitalizes biological energy during sleep. This can be enhanced by sleeping in a magnetic field. Then, anabolic hormones, such as melatonin and DHEA, are made. Melatonin, made by the pineal gland, is a master hormone controlling the entire energy system.

Quicker Healing The medical community has known for years that pulsed biomagnetic therapy promotes the healing process, particularly of bone fractures. For over 40 years, many doctors have used pulsed biomagnetic therapy to treat fractures and have had a high rate of success. Several magnetic instruments have already been FDA-approved and sanctioned for both safety and therapeutic implications.

The success of this therapy is attributed, in part, to its facilitating the migration of calcium ions and osteoblasts to heal broken bones in less than the usual time. In addition, the migration of calcium occurs away from joints to reduce painful arthritic joint inflammation. The end result is the noninvasive promotion of natural healing, without the use of unnatural chemicals and drugs. Adequate magnetic energy also softens or eliminates scar tissue formed during the healing process.

Some doctors put magnets into the dressings over fractures. In fact, one veterinarian I know, who broke his ankle after falling from a horse, reported following this strategy on himself.

Increased Athletic Endurance and Performance For years, magnetic therapy has been used around the world on race horses to heal injuries and enhance performance. Doug Hannum, owner of the Equine Therapy Center in Camden, South Carolina, employs magnetic blankets along with other natural healing modalities on animals, and professional riders, such as five-time Olympian Bruce Davidson and world championship rider Dorothy Trapp, ship their steeds to Hannum for therapy.

Stunning successes with animals have prompted professional athletes to use magnets. The Russians may have been the first in recent athletic history to have adapted magnetic therapy to foster greater athletic strength and achievement. Today, many notable American athletes embrace this technology as well. Denver Bronco linebacker Bill Romanowski revitalized his aching body by sleeping on a magnetic mattress pad. Yankee pitcher Irabu plays with dozens of magnets stuck to his body. Top golfer Jim Colbert endorses magnets. And professional football player Steve Atwinter, a seven-time pro-bowler, says, "I am not waiting for scientists to bless it. I only know it works." Even high schools are turning to magnetic therapy to improve athletic performance.

Although the effect of increased endurance and performance is known, the cause is not definitively understood. It is felt that magnetic energy warms up the muscles and joints so that performance is increased. At least as important, serious injuries are reduced. In addition, it is known that magnetic energy increases blood flow to the muscles, thereby increasing strength at these work sites.

Specific Uses

In addition to its general benefits, biomagnetic therapy may help a variety of specific conditions. This is not to say that magnets will cure absolutely, irreversibly, and indefinitely. How much good they do varies from person to person and depends upon such factors as the depth of the problem, how long the condition has been in existence, and how strong the magnet is.

Also, when using magnets for chronic longstanding conditions, where the tissues have not been getting adequate blood flow, you may at first get an exacerbation of symptoms. Some people call this a healing crisis. The discomfort usually passes in 24 to 48 hours. In the meantime, one may wish to take some Tylenol, aspirin, or similar pain-relieving medication to help with the discomfort until the body starts to recover its circulation. One alternative is to decrease the length of time the magnet is worn in the beginning and to gradually increase the time.

When using magnets for healing purposes, the strength should generally be between 100 and 500 gauss. Most treatments employ static magnets. However, when treating fractures, either static or pulsed electromagnets can be useful. Here are some conditions for which magnets can be helpful.

Aging Magnets activate life-promoting enzymatic activity which, in turn, encourages normal cell division. This creates a healthier organism and may then slow down the aging process. Several studies on animals show magnetic therapy to increase lifespan. In order to balance the energy of the organs and glands throughout the body, it has been suggested that one apply magnetic fields to the whole body. Sleeping on a magnetic bed is an excellent way to accomplish this. Drinking magnetized water is another good habit

to get into. Additionally, injured or weak areas of the body can be strengthened by applying magnets to these specific sites.

Amputations Many amputees suffer from a phenomenon called phantom pain; i.e., they feel pain in a limb that was removed. Many of these patients have vascular problems. Research shows that in many, magnets can improve the flow of blood in the stump and cause phantom pain to go away.

Appendicitis A northern or bipolar magnet can be placed over the affected area. In advanced infections, however, you should not hesitate to call a doctor, as this is an emergency situation.

Arthritis Magnetic therapy may be one of the most effective methods for achieving relief from arthritis, according to a recent study published in the "Journal of Rheumatology" (November 1997, p. 1200). Placing the north pole of a magnet over an inflamed area on a regular basis may be a key factor in improvement, especially for arthritis in the hands and feet. Magnetic therapy may help reduce bone and tissue degeneration.

Asthma and Bronchitis Wearing a strong neodymium magnet over the chest to cover the bronchial tubes and at an equal level on the back may help these conditions. In addition, sleeping on a magnetic mattress pad can be beneficial. It may take several days before breathing returns to normal, and magnets can be worn continuously during that time.

Scientific evidence supports the use of magnets in bronchitis, in both adults and children. In his clinical practice, Dr. William Pawluk reported success after a patient of his, who suffered from chronic bronchitis after having been poisoned by mustard gas, used magnet therapy. The use of this treatment resulted in a greater ease of breathing.

Breast Fissures Breast fissures are skin wounds that occur in women who are breastfeeding. Placing magnets over the wounded skin can help the fissure heal more quickly.

Burns Magnets can help speed up the healing of all but the most serious burns. They are good to keep around the kitchen for burns received after touching a hot stove or picking up something that is scalding. Magnets should be placed over the site of injury. For slightly more serious burns, the use of magnets may help reduce the need for analgesics to control pain..

Cancer Cells depolarize before becoming metastatic, and so one can speculate on how this approach may have been successful in those clinical cases that have responded to magnet therapy. When using magnets for cancer, remember the following rules of thumb: The magnetic pole used must be negative. The field should be larger than the primary lesion and the gauss greater than 25. Success rate increases if both the gauss and duration are increased. A minimal duration of 20 hours per day for no less than three months is required in most cases. The therapeutic effect is, in part, a result of the negative pole producing alkaline hyperoxia (abundance of oxygen). Cancer cells form

their energy by making ATP in an acid anaerobic environment, which is termed acid hypoxia.

Russian reports indicate that using magnetic therapy along with chemotherapy increases success in the treatment of brain tumors. Patients given magnetic therapy were less sick than patients who did not receive it, and they recovered more quickly. They also had fewer problems with their adrenal glands, which chemotherapy can sometimes affect.

Since the amount of information available on magnetic therapy with cancer is so limited, and since cancer is such a serious condition, one should never consider magnets as a sole therapy.

Carpal Tunnel Syndrome Magnets can be applied to the front and back of the wrist to help this hard-to-heal condition. While the symptoms can be controlled with the help of magnets, one should not expect the condition to be automatically cured.

Cervicitis The Russians have designed magnets for intravaginal use to alleviate chronic cervicitis. They are placed in the vagina, next to the cervix. While this method may be useful for chronic cervicitis, it probably should not be used for acute infections, such as yeast infections.

Circulatory Problems One can place magnetic strips along the forearm and sleep on a magnetic pad at night.

Depression When magnets are placed over the head, they can help lift one's mood and promote relaxation.

Dermatitis As magnets decrease swelling of any kind, they can be placed over any area of inflamed, red, itchy skin with favorable results.

Ear Pain Magnets can be placed over the painful site. Medical advice should also be sought, though, particularly for children.

Endometriosis This painful condition causes little blood spots inside the pelvis and is characterized by tissue irritation, inflammation, and pain. Women with infertility problems often suffer from this. Benefit can be realized through magnetic therapy, although it might take several months. In one study, good results were seen when 250-gauss magnets were placed over the lower abdomen for six to 12 hours.

Fibromyalgia One should sleep on a magnetic mattress pad and use a magnetic pillow. Magnets can also be placed over painful areas during the day.

Foot and Leg Problems Magnetic insoles will increase circulation and help conditions such as numbness, burning, aches, restlessness, and leg cramps. In addition, one should sleep on a magnetic mattress pad.

Head Injuries Head injuries, even mild ones, can leave people with chronic, debilitating problems, many of which show up years later as headaches, memory disorders, chronic fatigue syndrome, eye problems, irritability, or other symptoms.

Magnets placed around the head and neck can correct the electrical imbalance precipitated by the injury.

Heart Disease A neodymium magnet worn over the heart may assist the body in healing itself, and may, in time, allow one to lessen or discontinue medications. Of course, one should always follow a physician's advice.

Some of the effects of magnets on circulatory function are greater blood vessel dilation and increased oxygenation of tissues. Biomagnetic therapy may also improve vascular resistance and decrease the stickiness of blood platelets. People with a peripheral vascular disorder and arteriosclerosis may therefore benefit from magnetic therapy. Biomagnetic therapy may also undo blockages throughout the body, such as in the vessels of the lower extremities, the arteries in the neck, and the blood vessels in the hands and arms. By opening up a blockage in the heart, magnets may help prevent or improve ischemic heart disease, angina, and heart attacks.

Muscle Spasms One of the major actions of magnets is to decrease spasms in muscles. If you pull a back muscle or you're under a lot of stress, those muscles may tighten up. Placing small round magnets or little block magnets over those areas can make a significant difference.

Dr. Pawluk* reports additional relief when acupuncture meridians are stimulated with magnets: "In some patients, myself included, I've placed a magnetic pad over the sacral area because it hits the bladder meridian going up the back. The bladder meridian controls the energy flowing through the muscles, all the way up and down the back, including, to some extent, the shoulders. If you increase the energy flow along the bladder area, it will help a muscle problem or tension up into the shoulders."

Muscle Strains and Sprains and Joint Pain Dr. Pawluk* reports success after applying a magnet over the site of a torn muscle: "While playing with the family dog, I tore a muscle in my calf. It was very painful. I covered the area with a large magnetic pad, one that was probably 8 x 10 inches wide. And I wrapped an Ace bandage around that. I wore that for three days. It made a significant improvement in the pain and discomfort and reduced the bruising around the tissues."

Local applications are appropriate for these types of problems. Wear the magnet for several hours, and then take a break from it. Either wear the magnet all day and take it off during the night or vice versa. The same rule applies to joint pain. A magnet can be taped over the joint for a set period of time. Additional benefit can be derived if magnets are placed over corresponding acupuncture points.

Inexpensive Radio Shack magnets can be very effective when worn over the site of a local strain or sprain.

Neuritis The Russians performed a study of 39 neuritis patients on medication alone, and an equal number on medicine plus magnetic treatments. Magnets were placed along the spine, even though the neuropathy may have been experienced in the arms. The assumption was that some of the information processing originated in the spine. Therefore, treating the spine would be reflected in improvement in the arms. The experiment found a great degree of improvement in both groups, but particularly in the

group receiving medication plus magnetic treatment. Pain was reduced and nerve reflexes improved.

Post-Polio Syndrome Recently, a study was performed examining the effect of bipolar magnets on post-polio syndrome, a condition characterized by muscle tenderness and pain in patients who have had polio. The condition occurs years after the original damage from the polio virus. Application of magnets to these tender, painful spots was shown to alleviate pain in this double-blind placebo-controlled study, the results of which were published in the November 1997 issue of the "Archives of Physical Medicine and Rehabilitation".

Rheumatoid Arthritis Magnets act as an anti-inflammatory, and therefore help some chronic inflammatory conditions, such as rheumatoid arthritis.

Surgery Some studies have shown that using magnets for 24 to 48 hours before surgery, over the site where the incision will be made, results in better post-operative recovery. Additionally, wearing magnets over a wound after the sutures have been put in can also speed up healing.

Length of Exposure

In many studies using magnets, patients experience favorable results with intermittent use as opposed to continual wear. In other research and clinical experience, conditions are alleviated when magnets are worn full-time. This raises questions for further research: Should magnets be worn all the time or should they be worn for certain intervals? Should the length of time they are worn vary from condition to condition or person to person?

Dr. Pawluk* asserts that research shows that if magnets are worn all the time, the body may adapt to the field and establish a new level of homeostasis. This can be compared, Pawluk explains, to walking into a room that has the scent of flowers. After one is there awhile, the smell becomes imperceptible. The body may, therefore, need a periodic time-off from magnets.

WHAT THE FUTURE HOLDS

In the twenty-first century, medicine will change from a field dominated by chemistry and surgery to one that promotes the body's own healing ability, and biomagnetic therapy will surely play a big part in this shift. At present, while magnetism's ability to alleviate a variety of conditions is well-documented, we do not completely understand how this happens. So more basic research is needed. We need, too, to provide greater knowledge about how to manipulate magnets for the best effects. As we increase both our scientific and clinical understanding, skeptics in the medical community will be won over to this vitally important healing modality.

A burgeoning field of inquiry involves methods of slowing the aging process. Anti-aging research to date has focused on medicinal herbs, hormones, and nutrients that enhance health but do not necessarily lengthen the genetically determined lifespan. A popular belief has been that each cell has a figurative biological clock that

predetermines senescence and maximum lifespan. For years, scientists have tried to identify the exact nature of this clock, and recently, they seem to have done so. It seems that each time a normal cell divides it loses small portions of the ends of its chromosomes, which are regions called telomeres. When telomeres are shortened to a certain critical length, the cell can no longer divide. This results in the cell growing old and eventually dying.

Part of this divisional activity requires bonding of proteins to each other through a process known as hydrogen bonding. It is known that hydrogen bonds are influenced by magnetic fields, and there is a possibility that magnetic fields can be used to affect hydrogen bonding in a way that will reset the biological clock.

Another factor in aging is a decrease in the production of the hormone DHEA. It is known that magnetic energy can influence hormone production from the pineal gland. It will be interesting to determine if this therapy can influence the production of DHEA, with a resultant slowing of the aging process.®PG¯

RESOURCES

*Dr. William Pawluk can be reached at:

William Pawluk, MD
P.O. Box 366
325 Centerton Road
Rancocas, NJ 08073
609-267-9085, Fax 609-267-8615
wpaw@home.com

Dr. Pawluk's Book on Magnetic Therapy:

Magnetic Therapy in Eastern Europe: Review of 30 Years of Research
by J. Jerabek & William Pawluk, MD
Published 1998

Where to Get Magnetic Products

Albert Roy Davis Research Labs

American Health Service
694 S. Waukegan Rd., Dept. F
Lake Forest, IL 60045
1-800-544-7521

Ameriflex, Inc.®MDNM
232 NE Lincoln St., Suite G
Hillsboro, OR 97124
503-640-0810
Fax: 503-640-0517

Bio-Magnetics
Attn.: Larry Molnar
P.O. Box 223
Bowie, AZ 85605
602-847-2209

Body Magnetics
871 Thrall Avenue
Suffield, CT 06078
203-231-2377

Breakthrough Media, Inc
5065 SW 153rd Avenue
Beaverton, OR 97007
800-321-5641

Dendee International
Dennis & Delores Mosher
P.O. Box 106
Clearlake, IA 50428
515-357-7893

Emerson Worldwide
www.emersonww.com

Enviro-Tech Products
Dr. William or Katherine Philpott
or Len or Joyce Lothrup
17171 SE 29th St.
Choctaw, OK 73020
800-445-1962
405-390-3499
Fax: 405-390-2968

His Way Magnetic Health Products
Route 30 Mall
Clementon, NJ 08021
800-307-9991

HSW Systems
Russell Hojnowski
P.O. Box 68127
Virginia Beach, VA 23471
800-793-3757
http://www.soul-utions.com

Interceptor Industries
Bio-Magnetic Products
P.O. Box 827

Lake Orion, MI 48361
888-736-8811

Japan Life
(multilevel marketing company)
One Executive Drive
Fort Lee, NJ 07024
201-944-7790
Fax: 201-944-5507

LHASA Medical, Inc.
539 Accord Station
Accord, MA 02018-0539
800-722-8775
617-335-6484
Fax: 617-335-6296

Magna-Pak, Inc.
P.O. Box 27106
London, Ontario
Canada N5X 3X5

MagneTherapy Products
4926 Indian Springs Ct.
Plant City, FL 33565
813-757-0508
813-757-6770

MagnetiCo, Inc.
Dr. Dean Bonlie
#107, 5421 11th St N.E.
Calgary, Alberta T2E 6M4 Canada
800-265-1119
403-730-0883

Magnetic Health Products
5 Burns Street
Byron Bay, 2481 UK
066-857-842 (tel./fax)

Magnetic Therapeutic Technologies, Inc.
1915 Peters Road, Suite 308
Irving, Texas 75061
PH# 972-721-9227
FAX# 972-721-1279
TOLL FREE # 800-371-1113
web site: www.mplusmagnet.com
email: mttjim@mplusmagnet.com

Magnetic Wellness Centers
9711 Montgomery Rd.
Cincinattti, OH 45242
800-484-7964 (code 1956)

Magnet-X Corporation
#8, 2180 Pegasus Way
Calgary, Alberta T2E 8M5 Canada
800-667-0000
403-291-3090

Mid-American Marketing
PO Box 124
Eaton, OH 45320
1-800-922-1744
219-749-6666
Fax: 513-456-5424

NeuroMagnetic Systems
William or Leane Roffey-Orlando
999 E. Basse Rd., Suite 180
San Antonio, TX 78209
210-824-5352

Nikken, Inc.
(multilevel marketing company)
10866 Wilshire Blvd., Suite 250
Los Angeles, CA 90024
800-669-8859
310-446-4300

Norso Biomagnetics, Inc.
Jim Sauder
4105 Starboard Court
Raleigh, NC 27613
800-480-8601
919-783-5911
919-781-8374

Oriental Medical Supplies, Inc.
1950 Washington Street
Braintree, MA 02184
800-323-1839
617-331-3370
Fax: 617-335-5770

Planetary Herbal Products
Box 7145
Santa Cruz, CA 95061
800-464-1233

Post International
P.O. Box 788
Roy, WA 98580
206-843-1321

PsychoPhysics Labs
Dr. Buryl Payne
4264 Topsail Ct.
Soquel, CA 95073
408-462-1588

Quantum Magnetics
Magnet Relief Products
2602 South Dixie Highway, Suite 7
West Palm Beach, FL 33401
800-525-0644
561-832-9971.

R.D.G. Technologies, Inc
Bill Roper
913 9th Terrace
Palm Beach Gardens, FL 33418
407-625-0462

Walter C. Rawls (for information and books)
P.O. Box 655
Green Cove Springs, FL 32043
904-264-8564

SBJ Enterprises
4036 W. Grand Blanc Road #800
Swartz Creek, MI 48472
810-750-8484

Tengam
Tom Nellessen
4957 Bittrich-Antler Road
Dear Park, WA 99006
509-276-2054

Dr. John Zimmerman
2490 W. Moana Ln.
Reno, NV 89509
702-827-9099
(Dr. Zimmerman provides a comprehensive information package on over two dozen companies selling therapeutic magnetic products, ranging from the two largest, Nikken and Japan Life, all the way to mom-and-pop operations that sell far less. Some that he recommends highly are Nikken, Magnet Therapy, Inc. (also called Tectonics), and Magnet Relief. The latter is particularly noteworthy for its well-designed magnetic pads.

His packet costs $10, which helps to provide support for the Bio-Electro-Magnetics Institute to carry on its research.)

Additional Reading

The Anatomy of Biomagnetism
By Albert Roy Davis, Ph.D

The Art of Magnetic Healing
By Santwani

Biomagnetic Handbook: A Guide to Medical Magnets: The Energy of Tomorrow
By William H. Philpott, M.D. and Sharon Taplin

The Body Electric: Electromagnetism and The Foundation of Life
By Robert O. Becker, M.D., and Gary Seldon

The Body Magnetic
By Dr. Buryl Payne

The Book of Magnetic Healing & Treatments
By Noel C. Norris

The Cancer Cure that Worked: Fifty Years of Suppression
By Barry Lynes with John Crane

Cross Currents
By Robert O. Becker

Discovery of Magnetic Health: A Health Care Alternative
By George J. Washnis and Richard Z. Hircak

The Electric Wilderness
By Andrew Marino and Joel Ray

Electromagnetic Pollution Solution
By Glen Swartout

Getting Started in Magnetic Healing
By Dr. Buryl Payne

Healing Magnetism
By Heinz Schiegl

Magnet Therapy
By Holger Hannemann

Magnetic Therapy in Eastern Europe: Review of 30 Years of Research
by J. Jerabek & William Pawluk, MD
Published 1998

The Magnetic Blueprint of Life
By Albert Roy Davis and Walter C. Rawls, Jr.

The Magnetic Effect
By Albert Roy Davis and Walter C. Rawls, Jr.

Magnetic Field Therapy Handbook
By R. Allen Walls

Magnet Therapy: Balancing Your Body's Energy Flow for Self-Healing
By Holger Hanneman

Magnet Therapy Theory and Practice
By Dr. Neville S. Bengali

Magnetic/Oxygen Answer for Infection and Toxicity
By William H. Philpott, M.D.

Magnetism and its Effect on the Living System
By Albert Roy Davis and Walter C. Rawls, Jr.

Medical Magnets: Nature's Healing Energy
By Barbara Gordon

The Secret of Life: Cosmic Rays and Radiations of Living Beings
By Georges Lakhovsky

Terminal Shock: The Health Hazards of Video Display Terminals
By Bob Dematto

Your Complete Guide to TENS
By Barbara Gordon

Vibrational Medicine: New Choices for Healing Ourselves
By Richard Gerber

The Zapping of America: Microwaves, Their Deadly Risk, and the Coverup
By Paul Brodeur

PEER-REVIEWED SCIENTIFIC STUDIES

Gary's Web Hint	Click the number at the end of each paragraph in this section to see the relevant endnote.

Following are descriptions of recent studies, published in peer-reviewed scientific journals, on the impact of treatment with magnetic fields on a variety of conditions.

Alzheimer's Disease
This article reports on two Alzheimer's patients who experienced significant improvement in visual memory and drawing performance following the external application of electromagnetic fields ranging from 5 to 8 Hz. Improvements were also seen in other cognitive functions, including spatial orientation, mood, short-term memory, and social interactions.[1]

Noting that the disorganization of circadian rhythm (the daily biological clock) may be causally related to memory deterioration in old age and possibly to Alzheimer's disease, this article argues that the use of magnetic fields could lead to memory improvement among the elderly by means of resynchronization, or resetting, of the circadian rhythms.[2]

Amyotrophic Lateral Sclerosis (Lou Gehrig's Disease)
This article reports on three patients with amyotrophic lateral sclerosis who experienced beneficial effects following treatment consisting of three sessions per week of pulsed magnetic fields administered via a Magnobiopulse apparatus. Patients received upwards of 75 total sessions prior to achieving maximum recovery.[3]

Ankle Sprain
Results of this double-blind, placebo-controlled study indicated that treatment with two 30-minute sessions of noninvasive pulsed radiofrequency therapy is effective in significantly decreasing the time required for edema reduction in patients suffering from lateral ankle sprains.[4]

Arthritis
This study found that 3 hours of exposure to a 50-Hz magnetic field significantly inhibited experimentally induced inflammation and suppressed arthritis in rats.[5]

This double-blind, placebo-controlled study examined the effects of pulsed electrical fields administered over a period of 4 weeks in the treatment of arthritis of the hand. Results showed significant clinical improvement in patients receiving the therapy relative to controls.[7]

In this general review article on the treatment of patients with psoriatic arthritis with magnetic fields, the authors state that an alternating low-frequency magnetic field (30-40 mT) from such generators as "Polius-1" and "Polius-101" improves the clinical state of afflicted joints. Such treatments are normally carried out for 30 minutes per day over a period of 15 to 20 days.[8]

This study examined the effects of magnetolaser therapy either itself or in combination with conventional drugs in patients suffering from rheumatoid arthritis. Magnetolaser therapy involved the use of an AMLT-01 device and consisted of 6-minute exposures daily over a total of 14 days. Results showed a marked improvement following the first 3 days of magnetolaser therapy, with the strongest positive effects experienced by patients characterized as suffering from mild to moderate levels of the disease. At the end of the magnetolaser therapy course, 90 percent of patients showed improvement.[9]

This study examined the effects of low-frequency magnetic fields (from a "Polius-1" device) in patients 7 to 14 years old suffering from juvenile rheumatoid arthritis.

Treatment consisted of 10 daily exposures of 10 to 12 minutes each. Results showed beneficial effects in 58, 76, and 37 percent of patients in each of three experimental groups.[10]

This study examined the effects of low-frequency and constant magnetic fields in patients suffering from rheumatoid arthritis and osteoarthrosis. Low-frequency magnetic fields were shown to produce beneficial effects in patients with both stage I and II rheumatoid arthritis and with osteoarthrosis deformans, especially with respect to the wrists, knees, and ankles.[11]

Blepharitis (infection of the eyelid)
Results of this study indicated that the use of an alternating magnetic field in conjunction with a magnetic ointment containing reduced iron powder had beneficial effects in patients with chronic blepharitis.[12]

Bone Fractures
This study examined the effects of bone grafting and pulsed electromagnetic fields on a group of 83 adults with ununited fractures. Results showed a successful healing rate of 87 percent in the 38 patients originally treated with bone grafts and PEMF for ununited fractures with wide gaps, synovial pseudarthrosis, and malalignment. A healing rate of 93 percent was shown among the 45 patients who had initially been unsuccessfully treated with PEMF alone and had bone-grafting and were re-treated with pulsing electromagnetic fields.[14]

This study examined the effects of pulsing electromagnetic fields on 125 patients suffering from ununited fractures of the tibial diaphysis. Results showed a healing rate of 87 percent.[15]

Results of this study showed treatment with pulsed electromagnetic fields resulted in an overall success rate of at least 75 percent in patients suffering from tibial lesions.[16]

This review article makes the following observations with respect to the use of pulsed electromagnetic fields in treating ununited fractures, failed arthrodeses, and congenital pseudarthroses. The treatment has been shown to be more than 90 percent effective in adult patients. In cases where union does not occur with PEMFs alone after approximately four months, PEMF treatment coupled with fresh bone grafts ensures a maximum failure rate of only 1 to 1.5 percent. For those with delayed union three to four months following fracture, PEMFs appear to be more successful than in patients treated with other conservative methods. For more serious conditions, including infected nonunions, multiple surgical failures, long-standing atrophic lesions, failed knee arthrodeses after removal of infected prostheses, and congenital pseudarthroses, PEMF treatment has exhibited success in most patients.[17]

Results of this study found that 35 of 44 nonunited scaphoid fractures 6 months or older healed in a mean time of 4.3 months during pulsed electromagnetic field treatment using external coils and a thumb spica cast. [18]

This double-blind, placebo-controlled study examined the effects of pulsed electromagnetic fields in femoral neck fracture patients undergoing conventional therapy. PEMF treatment was started within two weeks of fracture, and patients were

instructed to make use of the electromagnetic device for 8 hours per day over a 90-day period. Results showed beneficial effects relative to controls after 18 months of follow-up.[19]

This review article on pulsing electromagnetic fields in the treatment of bone fracture observes that the surgically noninvasive outpatient method approved by the FDA in 1979 produced confirmed end results in 1007 ununited fractures and 71 failed arthrodeses, with an overall success rate at Columbia-Presbyterian Medical Center of 81 percent; an international success rate of 79 percent, and a success rate with other patients in the U.S. of 76 percent.[22]

Results of this double-blind study showed significant healing effects of low-frequency pulsing electromagnetic fields in patients treated with femoral intertrochanteric osteotomy for hip degenerative arthritis.[25]

In this study, 147 patients with fractures of the tibia, femur, and humerus who had failed to benefit from surgery received treatment with external skeletal fixation in situ and pulsed electromagnetic fields. Results indicated an overall success rate of 73 percent. Femur union was seen in 81 percent and tibia union in 75 percent.[26]

This study examined the effects of extremely-low-frequency electromagnetic fields (1-1000 Hz, 4 gauss) on new bone fractures of female patients. Results led the authors to suggest that EMF treatment accelerates the early stages of fracture healing.[27]

This study examined the preventive effects of low-frequency pulsing electromagnetic fields against delayed union in rat fibular osteotomies and diaphyseal tibia fractures in humans. Results indicated such treatment modulated and accelerated fracture union in both groups.[29]

This article discusses the cases of two children with bone malunion following lengthening of congenitally shortened lower legs. Pulsed sinusoidal magnetic field treatment was beneficial for both patients.[30]

Results of this study showed that 13 of 15 cases of long-bone nonunion treated with pulsed electromagnetic fields in combination with Denham external fixator united within several months.[31]

Results of this study found electromagnetic field stimulation to be an effective treatment for nonunion among a group of 37 French patients.[32]

Results of this study found treatment induced pulsing to be beneficial in patients suffering from nonunions unresponsive to surgery.[33]

In this interview with Dr. C. Andrew L. Bassett, a physician researching the use of pulsed electromagnetic fields for the past 30 years at Columbia University's Orthopedic Research Lab, Dr. Bassett notes that approximately 10,000 of the 12,000-plus orthopedic surgeons in the U.S. have used pulsed electromagnetic fields on at least one patient. Many such surgeons have incorporated the therapy on a more regular basis. He estimates that a total of at least 65,000 patients nationwide have received the treatment, with a probable success rate of between 80 and 90 percent. Use of the treatment has

been primarily in patients suffering from nonunited fractures, fusion failures, and pseudoarthrosis.[34]

Results of this study showed pulsed electromagnetic fields to have beneficial healing effects in patients suffering from difficult to treat and surgically resistant bone nonunions.[35]

This review article notes that the use of pulsed electromagnetic fields began in 1974, and that 250,000 nonunion patients have received the treatment since. The author argues that success rates are comparable to those of bone grafting, and that PEMF treatment is more cost-effective and free of side effects. The FDA approved PEMF use in 1982, although it remains widely unused due to physician misunderstanding and lack of knowledge concerning the treatment.[36]

This 7-year study examined data on more than 11,000 cases of nonunions treated with pulsed electromagnetic fields for up to 10 to 12 hours per day. Results indicated an overall success rate of 75 percent.[37]

This study examined the effects of low-frequency electromagnetic fields (1-1000 Hz) on middle-aged female patients suffering from fresh radius fractures. Results showed significant increases in scintimetric activity surrounding the fracture area after two weeks of EMF treatment relative to controls.[38]

This study examined the effects of constant magnetic fields in patients suffering from fractures. Results showed that magnetic exposure reduced pain and the onset of edema shortly after trauma. Where edema was already present, the treatment exhibited marked anti-inflammatory effects. The strongest beneficial effects occurred in patients suffering from fractures of the ankle joints.[39]

Results of this study found that 10 hours per day of electromagnetic stimulation (1.0-1.5 mV) produced complete union in 23 of 26 patients receiving the treatment for nonjoined fractures.[40]

This review article looks at the history of pulsed electromagnetic fields as a means of bone repair. The author argues that success rates have been either superior or equivalent to those of surgery, with PEMF free of side effects and risk.[41]

Bronchitis

Results of this double-blind, placebo-controlled study indicated that both low-frequency electromagnetic field treatment and treatment with pulsed electromagnetic fields proved effective in patients suffering from chronic bronchitis when coupled with standard drug therapies. Magnetic field treatment consisted of a total of 15 15-20-minute daily exposures.[42]

Cancer

Results of this study found that prolonged exposure to a 7-tesla uniform static magnetic field for a period of 64 hours inhibited growth of three human tumor cell lines in vitro.[43]

This study examined the effects of a rotational magnetic field on a group of 51 breast cancer patients. Results showed a significant positive response in 27 of them.[44]

Results of this study indicated that exposure to a rotational magnetic field inhibited Walker's carcinoma tumor growth as much as 90 percent in some cases.[45]

Results of this study indicated that pulsed magnetic field stimulation increased the incorporation of antitumor agents into cells, and thus increased antitumor activity shifting the cell cycle to a proliferative from a nonproliferative phase.[46]

Results of this study found that 20-30 sessions of magnetotherapy administered preoperatively exhibited antitumor effects in patients suffering from lung cancer.[47]

This study examined the effects of microwave resonance therapy (MRT) in patients suffering from various forms of cancer. Results showed that MRT treatment prior to surgery reduced the spread of cancer-associated conditions and reduced the risk associated with surgery in 87 percent of patients. MRT applied postoperatively had beneficial effects in 68 percent.[50]

Results of this study proved that the combination of weak pulsed electromagnetic fields with antioxidant supplementation is beneficial in the treatment of patients suffering from tongue cancer, improving speech, pain control, and tolerance to chemotherapy.[51]

Results of this controlled study indicated that treatment with a constant magnetic field significantly improved long-term (3-year) survival time in patients undergoing radiation therapy for cancer of the throat. Constant magnetic field therapy consisted of the application of 300 mT for 30 minutes to tumor and metastasizing regions immediately prior to each irradiation.[52]

Results of this Russian study indicated that the use of whole body eddy magnetic fields, coupled with more conventional cancer therapies (including magnetotherapy) is effective in the treatment of patients suffering from a variety of different malignancies.[53]

This article reports on the case of a 48-year-old-woman with breast cancer who was treated successfully with magnetotherapy. Infiltration showed a marked decrease following 30 whole body exposures to an eddy magnetic field for 60 minutes. One metastatic node disappeared while the size of others was reduced following 60 such exposures. A total regression of tumor and metastases was seen following the completion of a course of 110 exposures.[54]

This study examined the effects of whole body magnetic fields (16.5-35 G, 50-165 Hz) on patients suffering from different forms of cancer. Treatment consisted of 15 cycles, each 1-20 minutes in duration, and was coupled with more traditional cancer therapies. Results showed that the magnetotherapy had overall beneficial effects, particularly with respect to improved immune status and postoperative recovery.[55]

Cardiovascular/Coronary Heart Disease

Results of this study found that the addition of magnetotherapy to the treatment of patients suffering from ischemic heart disease and osteochondrosis led to clinical improvements.[57]

Results of this study involving 23 parasystolic children found that low-frequency magnetic field exposure improved humoral and cellular processes involved in the regulation of cardiac rhythm.[58]

The authors of this study report on their development of a polymagnetic system called Avrora-MK-01 used to administer impulse magnetic fields to diseases of the leg vessels. Results indicated positive effects on peripheral capillaries in 75-82 percent of patients receiving the treatment at a pre-gangrene stage.[59]

Results of this study showed exposure to low-frequency alternating magnetic fields had beneficial effects in children with primary arterial hypertension, as seen in the attenuation of sympathetic and vagotonic symptoms.[60]

This study demonstrated that traveling pulsed magnetic field and magnetic laser treatment produced beneficial effects in patients suffering from the initial stages of essential hypertension.[61]

In this article, the authors propose a new approach to treating atherosclerosis through the alteration of biophysical properties both intracellularly and extracellularly. Citing their own preliminary data, they suggest atherosclerotic lesions might be selectively resolved without harming normal blood vessels allowing the lesions to take up the magnetically excitable submicron particles and then applying an external alternating electromagnetic field.[62]

This study examined the effects of constant MKM2-1 magnets on essential hypertension patients. Results indicated the treatment decreased arterial pressure in stage II patients, with magnetotherapy being shown to produce beneficial effects on the central hemodynamics and microcirculation.[63]

Results from several recent studies conducted the author are reviewed. Conclusions are that pulsed electromagnetic fields exhibit protective effects against necrosis from acute ischemia in rats, cerebral infarcts in rabbits, and myocardium infarcts in rats.[64]

This study examined the effects of extremely high frequency electromagnetic radiation (EHF EMR) in 93 patients suffering ischemic heart disease. EHF treatment consisted of 10 to 15 exposures of the lower end of the sternum from a 'Yav'-1-7,1 device. Treatment was performed five times weekly for a total of 30 minutes per day, with drug therapy being maintained during this period. Positive results tended to occur after 5 to 6 treatment sessions, with a good or satisfactory response being reported in 82 of 93 patients, and lasting as long as 11 months after hospital release.[65]

This review article concerning the clinical application of electromagnetic fields notes that microwave therapy has been shown to improve local circulation and vascular tone, increase the volume of functional capillaries, lower hypertension, stimulate protein and carbohydrate metabolism, stimulate the pituitary-adrenal system, produce anti-inflammatory effects, and improve digestive organ function. Studies have shown decimeter wave therapy capable of stimulating the secretory function of the stomach, as well as blood circulation, respiratory function, and the immune system. Side effects have been reported in both human and animal studies.[67]

In this study, 30 myocardial infarction patients received millimeter-wave (MW) therapy in the form of 10 exposures of 30 minutes per day, with a 2-day interruption after the fifth exposure. Patients continued conventional drug treatment during the MW therapy period. Better results were seen in those patients exposed to the MW therapy relative to an equal number of patients receiving conventional treatment only.[68]

This study examined the effects of millimeter wave therapy in approximately 450 patients suffering from a variety of diseases, including those of the musculoskeletal, digestive, pulmonary, and nervous systems. Treatment consisted of 25-30 minutes per day using the "Porog-1" apparatus and generally lasted for a period of up to 10 days. Results showed positive effects in over 87 percent of the patients.[69]

Results of this study found that the use of magnetophore therapy (constant magnets applied to adrenal regions 10 hours per day for 15 days) significantly improved symptoms associated with hypertension in about 35 percent of patients studied, with mild improvement seen in 30 percent, and no improvement in 35 percent. Patients receiving decimeter-band waves (460 MHz, field intensity of 35-45 W, for 10-15 minutes per day for a total of 15 days) experienced similar results.[70]

Results of this placebo-controlled study demonstrated a 76-percent effectiveness rate for running impulse magnetic field therapy in a group of arterial hypertensive patients. Treatment consisted of two 25-minute exposures per day over a period of 10-20 total exposures, at frequencies of 10 or 100 Hz and magnetic field intensity of 3 or 10 mT.[71]

This study examined the efficacy of the reinfusion of autologous blood following magnetic field exposure in hypertensive patients. Positive effects were found in 92 percent of patients receiving the treatment.[73]

This double-blind, placebo-controlled study examined the effects of magnetotherapy in patients suffering from first- or second-stage hypertension. A magnetic field of 50 Hz, 15-25 mT was applied to acupuncture points He-Gu and Shen'-Men for 15-20 seconds per day for a total of 9-10 days. Results: The treatment improved headaches in 88 percent of patients, dizziness in 89 percent, and irritability in 88 percent. In general, 95 percent of hypertensive patients experienced beneficial effects from the treatment, and the morbidity rate decreased twofold following one course extended over a period of 5-6 months.[74]

This placebo-controlled study examined the effects of constant and of running magnetic fields in patients suffering from stage II hypertension. Results found that constant magnetic fields exhibited benefits in 68 percent of patients treated, and running magnetic fields were helpful in 78 percent. Only 30 percent of controls showed improvement. Constant magnetic field treatment consisted of constant magnets applied to the inner side of the wrist on each hand for 35-40 minutes daily over a period of 7-10 days. Running magnetic field treatment involved the use of a "Alimp-1" apparatus for 20 minutes per day for a total of 12-15 days.[76]

This double-blind, placebo-controlled study found that magnetotherapy was effective in the treatment of symptoms associated with stage II hypertension, such as headache, dizziness, and cardiodynia. The therapy consisted of permanent circular magnets (16

mT) applied to the inner forearm for 30-45 minutes per day over a period of 10 sessions.[77]

This controlled study examined the effects of magnetotherapy in patients suffering from neurocirculatory hypotension (low blood pressure) or hypertension (high blood pressure). Treatment consisted of a running pulsed magnetic field generated an "ALIMP" device (0.5 mT, 300 Hz) administered for 20 minutes per day over a course of 10 days. Patients suffering from hypotension did not benefit significantly from the magnetotherapy. Hypertension patients, however, showed a marked improvement with respect to symptoms including headache, chest pain, extremity numbness, abnormal systolic and diastolic blood pressure, and work capacity.[80]

This double-blind, placebo-controlled study found that low-frequency, low-intensity electrostatic fields (40-62 Hz) administered for 12-14 minutes per day helped normalize blood pressure in patients suffering from hypertension.[81]

This study examined the effects of low-frequency alternating magnetic fields in patients suffering from arteriosclerosis or osteoarthrosis deformans. Treatment involved 10-15 minute daily leg exposures over a total of 15 days. Results showed the treatment to be effective in 80 percent of arteriosclerosis patients and 70 percent of those with osteoarthrosis deformans.[82]

This study examined the effects of low-frequency magnetic fields (25 mT) in patients suffering atherosclerotic encephalopathy. Treatment involved 10-15 minute daily exposures over a total of 10-15 applications. Results showed clinical improvements with respect to chest pain, vertigo, headache, and other symptoms.[83]

Chronic Venous Insufficiency

This study examined the effects of alternating magnetic fields (15-20 minutes per day over a period of 20 days) in patients suffering from chronic venous insufficiency, varicose veins, and trophic shin ulcers. Results showed good effects in 236 of the 271 patients receiving the treatment. Thirty-four patients reported satisfactory effects. Only one patient experienced no effects.[85]

This review article notes that magnetotherapy in a variety of forms has been successfully used in the treatment of chronic venous insufficiency and is a commonly used physical therapy for the condition.[86]

This study examined the effects of running impulse magnetic fields in patients suffering from vessel obliteration diseases of the legs. Treatment consisted of 15-20 whole body exposures (0.5-5 mT, 1-2 Hz) lasting 15-20 minutes each. Results showed treatment led to a significant reduction in the number of patients experiencing leg pain while at rest. Among patients previously unable to walk a 500-m distance, 52 percent were able to complete the distance following treatment. Circulation improved in 75-82 percent of patients.[87]

Dental Problems

This placebo-controlled study examined the effects of micromagnets in the treatment of periodontal disease. Micromagnets were attached to the skin over areas of inflammation for a period ranging from 1 to 8 days, with the number of magnets used at once varying

from 1 to 6. The course of treatment lasted as long as 4 weeks. Results indicated that patients receiving the micromagnet therapy experienced earlier and more trouble-free recoveries following oral surgery, as well as less pain relative to controls.[99]

This controlled study examined the effects of adjunctive Diapulse electromagnetic therapy on oral surgery recovery. Patients received the therapy once per day beginning between 3 to 5 days prior to oral surgery. Therapy was maintained until the point of hospital release. Results found the therapy produced significant healing relative to controls, who received conventional treatment only.[100]

This study found that patients suffering from various oral diseases experienced more rapid healing when treated with both conventional therapies and 30 minutes per day of pulsed electromagnetic fields (5 mT, 30 Hz), as opposed to conventional therapies alone.[101]

Depression

This review article examined the literature concerning the use of transcranial magnetic stimulation in the treatment of depression. Results showed the high-frequency, repetitive transcranial magnetic stimulation treatment to be an effective, side-effect free therapy for depression that may hold promise for treating related psychiatric disorders as well.[103]

Noting that there is good reason to believe the pineal gland is a magnetosensitive system and that application of magnetic fields in experimental animals has a similar effect to that of acute exposure to light with respect to melatonin secretion, the authors propose that magnetic treatment could be a beneficial new therapy for winter depression in humans.[104]

This review article notes that transcranial magnetic stimulation has been shown to elicit antidepressant effects, electically stimulating deep regions of the brain.[105]

In this theoretical paper, the author argues that deep, low-rate transcranial magnetic stimulation can produce therapeutic effects equivalent to those of electroconvulsive therapy but without the dangerous side effects.[106]

This study examined the effects of millimeter wave (MW) therapy as a supplemental treatment in patients suffering from various types of depression. MW therapy involved the use of a "Yav'-1" apparatus (5.6 mm wavelength, 53 GHz), and consisted of up to 60 minutes of exposure per day, 2 to 3 times per week, for a total of as many as 15 exposures. Results showed that combined MW/conventional treatment produced a complete recovery in over 50 percent of cases studied, a significant improvement in 41 percent, and some improvement in 8 percent. Recovery rates among controls (conventional treatment only) were 4, 48, and 41 percent, respectively.[108]

Results of this study led researchers to conclude that patients suffering from major depression experienced a significant reduction of depressive symptoms following treatment with transcranial magnetic stimulation coupled with standard medication relative to patients taking the medicine. This was true after just three TMS treatments.[109]

Dermatitis
This study examined the effects of conventional treatments combined with millimeter wave (MW) therapy (54- to 70-GHz frequency, 8-15 daily exposures of 15-30 minutes each) on patients suffering from atopic dermatitis. Results indicated that the MW therapy was well-tolerated all patients, with the rash generally regressing after 7-8 exposures. Marked recovery was seen among 78 percent of patients receiving the combination treatments. Two-year follow-up showed a 23-percent relapse rate among combination patients, compared to 54 percent among controls.[110]

Diabetes
In this study, 320 diabetics received impulsed magnetic field treatment while 100 diabetics (controls) received conservative therapy alone. Results showed beneficial effects with respect to vascular complications in 74 percent of the patients receiving magnetotherapy combined with conservative methods, compared to a 28-percent effectiveness rate among controls.[111]

This study involving 72 diabetics with purulent wounds found that magnetic fields aided healing significantly.[113]

Diseases of the Larynx
Results of this study found that alternative magnetic field of sound frequency proved to be an effective treatment in patients suffering from acute inflammatory diseases of the larynx.[117]

Duchenne-Erb Disease
This study examined the effects of electromagnetic fields in the treatment of 5-year-old children suffering from Duchenne-Erb disease. Children were exposed to either UHF or DMW therapy for 8-12 minutes per day on alternating days over a period of approximately 10 days. Following the electromagnetic fields course, children received mud applications on the collar area and injured extremity. Results showed that treatment decreased contractures in shoulder and elbow joints, increased mobility and muscle strength, and improved general function of the arm.[118]

Endometriosis
This study found that a combined treatment consisting of magnetic-infrared-laser therapy (10-15 min/day ever other day over a period of 10-14 exposures, then repeated in 2-3 months) and conventional drug therapy proved highly effective in women suffering from endometriosis.[119]

Endometritis
Results of this study found that the administration of constant magnetic field in combination with other treatment modalities led to significant beneficial effects in patients suffering from acute endometritis following abortion.[120]

Epilepsy
This article reports on the cases of three patients with partial seizures who received treatment with external artificial magnetic fields of low intensity. Such treatment led to a significant attenuation of seizure frequency over a 10-14-month period.[121]

Experimental results indicated that the administration of modulated electromagnetic fields of 2-30 Hz suppressed epilepsy in rats.[122]

This review article cites one study in particular in which results showed that pretreatment with 30 minutes of exposure to a 75-mT pole strength, DC-powered magnetic field significantly prevented experimentally induced seizures in mice.[123]

This double-blind, placebo-controlled study examined the effects of 2-hour exposure to weak magnetic fields (0.2-0.7 G, irregularly oscillating 0.026-0.067 Hz) produced 3 pairs of orthogonal Helmholtz coils on pain perception in healthy subjects. Results showed that magnetic treatment significantly reduced the perception of pain.[124]

This article reports on the case of a severe epileptic who experienced a significant lessening of behavior disturbances and seizure frequency following treatment with low-frequency, external artificial magnetic fields.[125]

Low-frequency, external artificial magnetic field treatment was shown to significantly reduce seizures in four adult epileptic cases.[126]

Gastroduodenitis

Results of this study indicated that treatment with decimeter-band electromagnetic fields improved motor function of the stomach and reduced dyspepsia and pain in children suffering from chronic gastroduodenitis. Treatment made use of the "Romashka" apparatus (a cylinder applicator, 100 mm in diameter, power of 6-8 W) applied to the gastroduodenal region, and consisted of 6-12 minute exposures every other day for a total of 8-12 exposures.[129]

This controlled study examined the effects of sinusoidally modulated currents (100 Hz) coupled with conventional therapy in children suffering from chronic gastroduodenitis. Children received 8-10 exposures lasting between 6 and 10 minutes. Results showed that the treatment reduced inflammation in 72 percent of patients relative to just a 45-percent rate among controls. About 77 percent of treatment patients experienced elimination of gastro-esophageal and duodeno-gastral refluxes, compared to 29 percent of controls.[130]

General

Results of this study indicated that the optimal frequency of pulsed magnetic fields ranges between 10.0 and 25.0 Hz in the treatment of chronic inflammatory conditions of the locomotor apparatus, ischemia of the blood vessels of the lower extremities, dyspeptic syndrome, lactation mastitis, and other diseases. Treatment proved best when the therapeutic cycle was repeated after a 2-3 month period.[131]

This article reviews the use of magnetotherapy in Czechoslovakia. Noting that this modality has been used for more than a decade, the author states that magnetotherapy has been shown to be effective in treating rheumatic diseases, sinusitis, enuresis, and ischemic disorders of the lower extremities. Positive findings have also been shown with respect to multiple sclerosis and degenerative diseases of the retina.[132]

This review article notes that pulse-type electromagnetic fields (PEMF) are the most frequently used type of electromagnetic therapy. Another form is pulsed radio

frequency; PRF therapy generally includes daily sessions of 30-minute exposure and is primarily used in cases of pain and edema, with results being apparent quickly when the therapy is effective. PEMF treatment is most successful when used in bone healing, with results occurring over a longer period of time.[133]

This study examined the effects of electromagnetic fields administered over a period of 10 days on 354 patients suffering from various orthopedic conditions. Results showed the effects to be positive, with the greatest benefit experienced among patients with acute lesions.[134]

Noting that beneficial effects of low-energy, time-varying magnetic fields have been shown since the early 1970s, this review article cites studies pointing to its success in the treatment of a wide range of conditions. The best results for this modality obtained in the area of bone healing.[135]

This review article claims that over a quarter of a million patients worldwide with chronically ununited fractures have experienced beneficial results from treatment with pulsed electromagnetic fields. In addition, the author cites studies pointing to the treatment's efficacy with respect to other conditions such as nerve regeneration, wound healing, graft behavior, diabetes, heart attack, and stroke.[136]

This review article notes that low-intensity millimeter waves have been used for treating a wide variety of medical conditions in the former Soviet Union since 1977, with more than a million patients treated and more than a thousand treatment centers in existence. This therapy has been approved for widespread use the Russian Ministry of Health, and over 300 scientific publications have described its effects. A typical course of treatment involves 10-15 daily exposures ranging from 15 to 60 minutes each.[137]

This study concluded that the use of millimeter wave (MW) therapy was effective in the treatment of both children and adults suffering from a variety of orthopedic diseases, including osteochondrosis, arthrosis, infantile cerebral paralysis, Perthes' disease, and inborn femur dislocation. MW therapy made use of the G4-142 apparatus (55-65 GHz). Exposure was for 15-30 minutes in children or 30-60 minutes in adults over a period of 10-12 total exposures.[138]

This research examined the effects of low-frequency pulsed electromagnetic fields on patients suffering from a wide range of disorders, including musculoskeletal disorders, neurological disorders, circulatory diseases, traumatic disorders, gastroenterological problems, and stress-related morbidity. Treatment made use of the Rhumart apparatus, which produced waveforms with peak amplitudes up to 30 G. Results, based on the patients' own subjective ratings, indicated the treatment to be beneficial across most conditions, with the strongest effects seen in those suffering from musculoskeletal and traumatic disorders.[139]

This review article summarizes findings presented at the Third Workshop on the use of low-intensity millimeter waves in medicine, held in Zvenigorod, Moscow Region, Russia. Such findings pointed to the efficacy of MW therapy with respect to alcoholism and its associated symptoms, gastric and duodenal ulcers, psoriasis, chronic furunculosis, and cardiovascular diseases.[140]

This study examined the effects of magnetotherapy on patients suffering from a variety of eye and brain vascular disorders. Treatment made use of the "Polius-1" apparatus (50 Hz), with most patients receiving a course of 15-20 daily exposures. Results showed overall general improvements in 95 percent of patients with eye diseases.[141]

This review article notes that low-frequency electromagnetic therapy has been used for a variety of purposes. Those specifically identified the author include cell growth promotion, pain reduction, improved blood circulation, bone repair, increased wound healing, sedative effects, enhanced sleep, and arthritic relief.[142]

This review article notes that treatment with an "Infita" apparatus, used to deliver low-frequency magnetic fields, has been shown to improve general hemodynamics and microcirculation in addition to exhibiting anti-inflammatory, sedative, and analgesic effects in Olympic-level Russian athletes.[143]

This review article cites studies pointing to the efficacy of low-frequency magnetic fields in the treatment of a wide variety of conditions, including burns, arthritis, fractures, arterial aneurysms, PMS, phantom pain, tuberculosis, ischemic heart disease, hypertension, bronchial asthma, and ulcerated varicose veins, among others.[144]

This study examined the effects of extremely-low-frequency magnetic fields (TAMMAT device) in the treatment of a group of 650 patients suffering from a host of various diseases. Treatment consisted 15-25 minute daily exposures 5 days per week over a total of 20-25 days. Most patients experienced improvements after 2-3 exposures. Marked improvements were seen with respect to analgesic, anti-inflammatory, anti-tumor, and immune-enhancing effects.[145]

This article reports on the efficacy of a Russian electromagnetic stimulation apparatus termed "Cascade." The authors state that data from 508 patients suffering from various ailments who were treated with the device indicate it to be anywhere from 75 to 100 percent effective. Examples of conditions in which the device was used include stubborn fractures, post-traumatic contractures, crush syndrome, and Perthes' disease.[146]

This review article on the use of pulsed magnetotherapy in Czechoslovakia points to its efficacy across a variety of conditions, including joint problems, enuresis, multiple sclerosis, diabetes, and carpal tunnel syndrome.[147]

Glaucoma

In this study, patients with primary open-angle glaucoma with compensated intraocular pressure were administered magnetotherapy using an ATOS device with 33-mT magnetic field induction. The procedure was administered to a patient in a sitting posture with a magnetic inductor held before the eye. Sessions lasted 10 minutes and each course included 10 sessions. Following 4-5 months of therapy, results showed improved vision acuity 0.16 diopters, on an average of 29 out of 30 eyes with vision acuity below 1.0.[149]

Hair Loss

This double-blind, placebo-controlled study examined the effects of pulsed electromagnetic fields on hair loss in men suffering from male pattern baldness. PEMF exposures were administered to the head for 12 minutes and were given weekly or twice

weekly over a period of 36 weeks. Results found the PEMF treatment both prevented hair loss and promoted regrowth without side effects.[151]

Headache

Results of this double-blind, placebo-controlled study demonstrated that the administration of a pulsed magnetic field for less than one hour to headache patients produced significant beneficial effects, as shown subjective patient reports, as well as EEG activity.[152]

This article reports on the case of an acute migraine patient who was successfully treated with external magnetic fields.[153]

This article examined the effects of millimeter wave therapy in the treatment of 107 patients suffering from headaches of varying causes. Treatment consisted of the Nao-Hu, Bai-Huei, and Hua-Chai acupuncture points being exposed to 5.6- and 4.9-mm wavelengths via the use of "Yav'-1-5.6" or "Electronka-KVCh" devices, respectively. Exposure lasted up to 60 minutes per day over a course of 10 days. All patients experienced positive results following 3-5 exposures. After one year, 48 percent of patients remained free of headaches, with a significant decrease in another 41 percent.[154]

This study examined the effects of pulsed electromagnetic fields (20 minutes per day for 15 days) in the treatment of patients suffering from chronic headaches. Results indicated the treatment to be most effective in patients suffering from tension headaches, with 88 percent of such patients reporting positive results. Beneficial results were also experienced patients suffering from migraines (60 percent), cervical migraines (68 percent), and psychogenic headaches (60 percent).[155]

In this study, 90 headache patients were treated with pulsating electromagnetic fields via large coils to the body for 20 minutes per day for a total of 15 days. Results found the treatment to be either excellent or good for those patients suffering from migraine, tension, and/or cervical headaches. Patients experiencing post-traumatic or cluster headaches did not experience such benefits.[156]

Results of this study indicated that pulsating electromagnetic fields (12 Hz and 5 mT) were an effective prophylactic treatment for patients suffering from cervical and migraine headaches.[157]

This placebo-controlled, double-blind study examined the effects of pulsed electromagnetic fields (2-5 Hz and flux densities of 3-4 mT) on patients suffering from migraine headaches. PEMFs were administered to the head for 10-15 minutes per day over a period of 30 days. Results showed a mean improvement level of 66 percent in patients receiving the treatment, compared to just 23 percent among controls.[158]

Hemophilia

In this study, hemophiliacs suffering from joint hemorrhage received millimeter wave (MW) therapy at biologically active points beginning on the first day of hospital release. Adults were treated with an "Electronica-KVCh" device (61 GHz, 5 mW maximum power) and children were treated with a "Porog" device, which generates low-intensity wide-band MMW noise. Exposures in both groups lasted for 20-25 minutes per day and were extended over a period of 10 days. Results indicated the treatment to be more

effective than conventional therapy with respect to alleviation of pain, need for medication, and other parameters.[159]

Hepatitis

This double-blind, placebo-controlled study examined the effects of millimeter wave therapy combined with conventional methods in the treatment of viral hepatitis in children. Making use of a "Yav'-1-5,6" or "Yav'-1-7,7" device, MW therapy involved 14-15 exposures of, on average, 30 minutes per day at wavelengths of either 5.6 or 7.1 mm. Results indicated the combined treatment to be more effective than conventional treatment only, leading to a more rapid restoration of liver function.[160]

Results of this study showed that the use of magnetic fields was effective in treating patients suffering from viral hepatitis who had previously not benefited from conventional drug therapies.[161]

This study examined the effects of magnetotherapy in children suffering from various forms of viral hepatitis. Magnetotherapy consisted of alternating magnetic fields applied to the liver area daily over a total of 10-15 days. Results indicated magnetotherapy led to more rapid and trouble-free recovery.[162]

Herniated Disk

This double-blind, placebo-controlled study examined the effects of magnetotherapy in patients following herniated disk surgery. Results showed that 52 percent of patients receiving the treatment compared to 30 percent of controls reported being free of symptoms at the time of hospital release.[163]

Hip Problems

This double-blind study examined the effects of pulsed electromagnetic fields on loosened hip prostheses. Results showed an increase of bone density in all patients receiving PEMF treatment compared to only 60 percent of controls. The authors argue such findings suggest PEMF elicits early bone reconstruction, which enhances early weight bearing.[164]

This study examined the effects of pulsed electromagnetic fields (50 Hz, 50 G) in treating aseptic loosening of total hip prostheses. PEMF therapy consisted of 20 minutes per day for 6 days per week over a total of 20 such sessions and was begun, on average, a year and a half following the start of loosening. Results showed PEMF to have some beneficial effects with respect to loosened hip arthroplasties, although it was not effective in patients suffering severe pain due to extreme loosening.[165]

Joint Disease

Results of this 11-year study involving 3014 patients found pulsed magnetic field treatment at low frequencies and intensities to be a highly effective, side-effect-free therapy for joint disease.[168]

Kidney Problems

This review article notes that placebo-controlled studies have shown positive results concerning the use of pulsed magnetic field therapy in the treatment of secondary chronic pyelonephritis.[171]

Lung Disease
This study examined the effects of low-frequency magnetic fields coupled with conventional therapies in rats suffering from inflammatory lung disease. Results showed that rats receiving the magnetic fields experienced significant reductions in lung abscesses and associated symptoms, and similar beneficial effects were seen among a group of 165 human patients receiving comparable treatment.[177]

Lupus Erythematosus
This review article examined the data concerning impulsed magnetic fields in the treatment of lupus erythematosus. Studies indicate that the treatment can be beneficial due to its anti-inflammatory and analgesic effects, its positive action on microcirculation, and immunological reactivity.[178]

This double-blind, placebo-controlled study examined the effects of UHF and microwave therapy in treating patients suffering from systemic lupus. Twenty-six patients were given 30-35 W of microwave irradiation administered to the adrenal region. Twenty-five patients were given 30-35 W UHF administered bilaterally to the temporal region. The treatment regimen for both groups included 18-20 daily sessions. A group of 11 patients were used as controls. Results showed both treatments to be effective, with 27 percent of microwave patients and 66 percent of UHF patients reporting total elimination of polyarthralgia, myalgia, and painful contractures.[179]

Results of this study indicated that the bitemporal application of ultrahigh-frequency electromagnetic fields to the hypothalamo-hypophyseal area daily over a period of 18-20 days had beneficial effects in patients suffering from systemic lupus erythematosus.[180]

Multiple Sclerosis
This article reports on the case of a 55-year-old female chronic progressive multiple sclerosis patient who received a single external application of low magnetic fields (7.5-picotesla; 5-Hz frequency) which lasted 20 minutes. The treatment quickly led to improvements in a variety of areas, including fatigue, sleep, vision, bladder function, movement and speech problems, and mood.[182]

This study reports on four cases of multiple sclerosis who experienced improvements in visuospatial and visuomotor functions following treatment with external application of low magnetic fields.[183]

This article reports on the case of a 50-year-old female chronic progressive multiple sclerosis patient who received a single external application of low magnetic fields who experienced significant improvements following the treatment.[184]

This article reports on the cases of three patients suffering from long-time symptoms of multiple sclerosis who received treatment with extracerebral pulsed electromagnetic fields over a period of between 6 and 18 months. Results showed all three patients experienced significant improvements in cognitive functions.[185]

This is a report on the cases of two chronic multiple sclerosis patients exhibiting severe speech problems. Symptoms were completely resolved following 3-4 weeks of treatment with pulsed electromagnetic fields.[186]

This article reports on the cases of three multiple sclerosis patients suffering from alexia (lack of understanding of written words) who experienced a reversal of the alexia following the start of picotesla-range electromagnetic field treatment.[187]

This article reports on the case of a middle-aged disabled female patient with a 19-year history of chronic relapsing-remitting multiple sclerosis. Within one day of receiving experimental treatment with picotesla electromagnetic fields, the patient exhibited improvements in her condition. The patient continued with 1-2 treatments per week over a period of 32 months. During this time, significant improvements were seen with respect to a range of physical symptoms, as well as cognitive functions.[188]

The cases of three female multiple sclerosis patients exhibiting suicidal behavior are discussed in this article. Treatment with pulsed picotesla-level electromagnetic fields resolved the suicidal behavior in all three patients, an improvement that was maintained over a follow-up period of 3.5 years.[189]

This article reports on the case of a 36-year-old man severely disabled with partial paralysis and lack of coordination. Three treatment sessions per week with pulsed electromagnetic fields over a period of one year led to a range of improvements, including improvements in gait, balance, bowel and bladder functions, vision, mood, and sleep. No progression of symptoms associated with multiple sclerosis was seen throughout the course of EMF treatment.[190]

This article reports on the cases of two multiple sclerosis patients suffering from chronic ataxia who performed poorly on human figure drawing tests administered to measure body image perception. Treatment with extracerebral applications of picotesla flux electromagnetic fields led to improvements in gait and balance as well as a normalization in body image perception as seen on a repeat of the same test each patient.[191]

This article reports on the case of a 51-year-old female patient with remitting-progressive multiple sclerosis who experienced a successful reduction in carbohydrate craving believed to be associated with the exacerbation of her condition following treatment with a series of extracranial AC pulsed applications of picotesla flux intensity electromagnetic fields.[192]

This article reports on the cases of three multiple sclerosis patients suffering from a chronic progressive course of the disease who experienced a reduction in tremors following treatment with brief external applications of pulsed EMFs of 7.5-pT intensity.[195]

This article reports on the cases of three female chronic multiple sclerosis patients who experienced a reversal of cognitive deficits following treatment with brief external applications of alternating pulsed electromagnetic fields in the picotesla range of intensity.[196]

This article reports on the cases of three female multiple sclerosis patients with poor word fluency who experienced a 100-percent increase in word output following 4-5 sessions of treatment with external applications of extremely weak electromagnetic fields in the picotesla range of intensity.[197]

This article reports on the case of a 58-year-old male multiple sclerosis patient with a 37-year history of the disease. Treatment with external application of magnetic fields in the picotesla range led to a speedy improvement of neurological symptoms in the areas of walking, balance, sensory symptoms, and bladder function. Improvements in numerous cognitive functions were seen within 24 hours of treatment as well.[198]

This article reports on the case of a 36-year-old multiple sclerosis patient who experienced immediate improvements in visuoperceptive functions following treatment with external application of picotesla-range magnetic fields.[199]

This article reports on the cases of three multiple sclerosis patients suffering from falls due to rapid deterioration in balance and triggered distracting external auditory stimuli. Treatment with a series of extracranially applied, low-frequency picotesla-range intensity electromagnetic fields quickly resolved such symptoms associated with a loss of balance.[200]

This article reports on the cases of three multiple sclerosis patients experiencing continuous and debilitating daily fatigue over the course of several years. Treatment with extracranially applied picotesla flux electromagnetic fields dramatically improved symptoms of fatigue in all three patients.[201]

This article reports on the cases of two female patients with chronic progressive-stage multiple sclerosis who suffered from regular worsening of their symptoms starting approximately a week prior to menstruation and abating at menstruation onset. Such symptoms were resolved in both patients two months following the start of treatment with the extracranial application of weak electromagnetic fields.[205]

This article reports on the case of a 64-year-old female patient with a 22-year history of chronic progressive multiple sclerosis. Two 30-minute treatments with low-level electromagnetic fields produced a marked improvement in a variety of symptoms.[207]

Results of this double-blind, placebo-controlled study found that pulsed electromagnetic fields administered daily over a period of 15 days proved to be an effective treatment in reducing spasticity and incontinence associated with multiple sclerosis.[209]

Results of this double-blind, placebo-controlled study indicated that pulsed electromagnetic fields administered daily over a period of 15 days is a generally effective treatment in reducing symptoms associated with multiple sclerosis, with the most positive improvements involving the alleviation of spasticity and pain.[210]

Results of this double-blind, placebo-controlled study indicated that exposure to magnetic fields produced beneficial clinical effects in patients suffering from cerebral paralysis and in patients with multiple sclerosis.[211]

Muscle Injury

This study examined the effects of pulsed electromagnetic fields on recovery following muscle injury in rats. Results showed that both pulsed and constant magnetic fields were equally effective, with the constant field being more intense.[212]

This study examined the effects of pulsed electromagnetic fields (Gyuling-Bordacs device) in patients suffering from peripheral muscle paralysis. Treatment consisted of 20-minute exposures (2-50 Hz, 70 G). Results showed 50-Hz pulsed electromagnetic fields to be the most effective level of treatment and that such therapy enhanced muscle irritability in peripheral paralysis patients as well as in healthy controls.[213]

Neck Pain

This double-blind, placebo-controlled study examined the effects of low-energy pulsed electromagnetic fields administered via soft collars on patients suffering from persistent neck pain. Results indicated significantly beneficial effects following three weeks of treatment.[214]

Nerve Damage

This controlled study found that exposure to pulsed electromagnetic fields enhanced the speed and degree of peripheral nerve regeneration twofold in rats with experimentally severed sciatic nerves.[215]

Results of this controlled study demonstrated that treatment with 15 minutes per day of pulsed electromagnetic fields enhanced recovery time of experimentally-injured nerves in rats.[216]

Results of this study indicated that the use of pulsed electromagnetic fields on experimentally divided and sutured nerves in rats sped up regeneration of damaged nerves and the time it took for limb use to be recovered.[219]

This study examined the effects of a Soviet Polyus-1 low-frequency magnetotherapy device used to administer approximately 10 mT for approximately 10 minutes in patients with optic nerve atrophy. Patients underwent 10-15 sessions per course. Results showed that vision acuity in patients with low acuity values (below 0.04 diopters) improved in 50 percent of cases. It was also found that the treatment improved ocular blood flow in cases of optic nerve atrophy. Optimal benefits were experienced after 10 therapy sessions.[220]

Neurological Disorders

This article summarizes clinical results obtained the authors in using pulsed electromagnetic fields (Gyuling-Bordacs device) in the treatment of neurological and locomotor disorders among a group of 148 patients in a hospital setting over a period of 3 years. The authors claim that 58-80 percent of such patients experienced benefits of some kind over the course of magnetotherapy.[221]

This study examined the effects of magnetotherapy on patients suffering from nervous system diseases. Treatment consisted of 10-12 6-minute exposures (10-20 kG, 0.1-0.6 Hz). Results indicated beneficial effects in 25 of the 27 patients receiving the treatment.[222]

Results of this study found that the use of magnetic fields (30-35 mT, 10 and 100 Hz) produced beneficial effects in 93 percent of patients suffering from nerve problems.[223]

Osteoarthritis
Results of this double-blind, placebo-controlled study indicated that exposure to pulsed electromagnetic fields had beneficial effects in the treatment of patients suffering from painful osteoarthritis of the knee or cervical spine. PEMF therapy consisted of 18 exposures lasting 30 minutes and administered 3-5 times per week.[224]

This double-blind, placebo-controlled study indicated that treatment with pulsed electromagnetic fields produced significant favorable effects in patients suffering from osteoarthritis.[226]

This double-blind, placebo-controlled study showed that treatment with pulsed electromagnetic fields yielded significant benefits in patients suffering from osteoarthritis of the knee or cervical spine. PEMF therapy (25 G, 5-24 Hz) consisted of 18 30-minute exposures over a period of 3-4 weeks.[227]

This controlled study examined the effects of changeable magnetic fields (Polus-101 device) coupled with more conventional therapies in the treatment of patients suffering from osteoarthrosis. Magnetic therapy consisted of daily 20 minute exposures for a total of 12 sessions. Results showed more rapid improvements of immunological indices and alleviation of symptoms associated with the disease among patients receiving the combination therapy compared to those treated only conventionally.[228]

Osteochondrosis
This study examined the effects of alternating magnetic fields (50 Hz, 10-50 mT) combined with conservative therapy in patients suffering from spinal osteochondrosis. Treatment consisted of 20-minute exposures over a total of 20-25 such exposures per course. Results showed clinical benefits in 95 percent of patients receiving the combination treatment compared to just 30 percent among controls.[229]

Osteonecrosis
This pilot study found that the use of pulsed electromagnetic fields produced beneficial effects in patients suffering from osteonecrosis of the femoral head.[230]

This study examined the use of pulsed electromagnetic fields in the treatment of osteonecrosis. Compared to published findings concerning surgical treatment, results showed PEMF therapy to be superior in producing improvement.[231]

Osteoporosis
This study examined the effects of pulsed electromagnetic fields on postmenopausal osteoporosis in 10-month-old female rats. Results showed that EMF treatment for one hour per day for 4 months with a 30-gauss maximum pulse reduced bone mass loss to within 10 percent, while a 70-gauss maximum pulse reduced bone mass loss entirely.[232]

This study examined the effects of long-term pulsing electromagnetic fields in the form of repetitive pulse burst waves over a period of 6 months in osteoporotic rats. Results showed increased bone volume and formation activity.[234]

This study examined the effects of a 72-Hz pulsating electromagnetic field administered for 10 hours per day over a period of 12 weeks on bone density in women prone to

osteoporosis. Results found significant increases in bone mineral density in the area of EMF exposure.[235]

In this study, osteoporosis patients received treatment with pulsed electromagnetic fields (50 G, 50-100 Hz) for 30 minutes per session over a period of two years involving 20 sessions. These subjects were compared to similar patients treated with calcitonin. Results indicated PEMF to be effective in reducing pain, and to be even more so when combined with the conventional drug treatment.[236]

This controlled study examined the effects of pulsed electromagnetic fields in women suffering from postmenopausal osteoporosis. Treatment consisted of daily 30-minute exposures for 20 days every six months. Results showed that PEMF treatment combined with 100 IU per day of nasal spray synthetic salmon calcitonin arrested bone decrease and significantly increased bone mass relative to patients receiving drug therapy alone.[237]

Results of this study found the use of total-body low-frequency magnetic fields (60 G, 50-100 Hz) to be effective in the treatment of patients suffering from osteoporosis-related symptoms. Treatment consisted of a total of 15 exposures of 30 minutes each.[238]

Otitis Externa

This study examined the effects synchronizing pulse waves in the impaired area when treating patients suffering from acute diffuse otitis externa with low-level magnetic fields in combination with conventional therapies. Patients were divided into three groups. The first received ultrahigh-frequency or very-high-frequency electromagnetic waves. The second received 15-minute daily exposures to 50-Hz alternating or pulsating 20-mT magnetic fields. The third group of patients were treated switching on the same magnetic fields only during propagation of the pulse wave through the ear vessels. Results showed a 100 percent recovery rate in patients across all three groups, with recovery taking the least amount of time among those in group 3.[239]

Pancreatitis

This study found that sinusoidal and continuous low-frequency alternating magnetic field generated a Polius-1 apparatus exhibited beneficial effects in patients suffering from chronic pancreatitis.[241]

This controlled study examined the effects of combining pulsed electric stimulation and laser light with conventional treatment in patients suffering from acute pancreatitis. Results showed the combined therapy to have the most significant effects in patients with severe forms of the disease.[242]

Parkinson's Disease

This article reports on the case of a 73-year-old male Parkinson's patients suffering from disabling resting and postural tremors in the right hand, as well as other symptoms. Two successive 20-minute treatments with AC pulsed electromagnetic fields of 7.5-picotesla intensity and 5-Hz frequency sinusoidal wave led to improvements in visuospatial performance and a legible signature. Significant improvements in Parkinsonian motor symptoms were also seen following additional treatments.[243]

This article reports on the case of a medicated 61-year-old Parkinson's patient who experienced rapid reversal of symptoms following a single external application of picotesla-range magnetic fields.[244]

This article reports on four Parkinson's patients who experienced significant improvement in symptoms following treatment with picotesla-range magnetic fields. Two additional patients suffering from Parkinson's-related dementia experienced significant improvements in visuospatial impairment.[245]

Noting that transcranial magnetic stimulation (TMS) is a new and noninvasive method of direct cortical neuron stimulation, this review article discusses recent studies showing that TMS has led to improvements in symptoms associated with Parkinson's disease and depression.[246]

Results of this study showed that the application of ELF magnetic fields via a plastic helmet device housing a set of coils (generating fields of 8 Hz and 7.5 pT) produced beneficial clinical effects after 30 minutes in patients suffering Parkinson's disease and multiple sclerosis.[247]

This article reports on the cases of two Parkinson's patients who experienced improvements in motor symptoms following treatment with external application of weak electromagnetic fields in the picotesla range.[248]

This article reports on the cases of three Parkinson's patients on full medication who exhibited an improvement in right hemispheric functions following a series of treatments with external application of electromagnetic fields in the picotesla range.[249]

This article reports on the case of a nonmedicated 49-year-old male Parkinson's patient who experienced a dramatic improvement in motor, depressive, and cognitive symptoms following treatment with brief extracranial applications of picotesla-range electromagnetic fields.[251]

This article reports on the case of a 61-year-old Parkinson's patient who experienced improvements in the severity of motor problems 30 minutes after treatment with external application of weak electromagnetic fields in the picotesla range. Sham treatment had no such effects in the same patient.[252]

This article reports on the cases of five Parkinsonian patients on full medication who experienced a marked improvement in performance on Thurstone's Word-Fluency Test following treatment with a series of extremely-low-intensity electromagnetic fields in the picotesla range and of 5-8 Hz frequency.[253]

This article reports on the case of a 69-year-old Parkinsonian patient who was able to discontinue most medication for two weeks following two treatment sessions with extracranial picotesla-range magnetic fields. Symptoms recurred after three weeks and the patient received four more magnetic field sessions on consecutive days after four weeks. The patient was then able to discontinue medications completely.[254]

This article reports on the cases of five medicated Parkinsonian patients who experienced improvements in motor, behavioral, and autonomic functions, and in

visuoconstructional tasks following treatment with extracranial application of magnetic fields in the picotesla range.[255]

This article reports on the cases of three medicated Parkinsonian patients who experienced relief from disabling periods of freezing gait following treatment with extracerebral applications of pulsed electromagnetic fields in the picotesla range.[256]

The cases of four nondemented Parkinsonian patients under full medication are discussed in this article. These patients performed poorly on human figure drawing tests administered to measure body image perception. Treatment with extracerebral applications of picotesla-range intensity electromagnetic fields led to marked improvements in body image perception as seen on a repeat of the same test each patient.[257]

This article reports on the cases of four medicated Parkinsonian patients who experienced reversal of visuospatial impairments as measured the Clock Drawing Test following treatment with externally applied weak electromagnetic fields of picotesla-range intensity.[258]

This article reports on the case of a 68-year-old male patient suffering from Parkinson's disease over a period of 7 years. The patient had experienced little relief from traditional medical therapy. Treatment with external application of picotesla-range magnetic fields led to quick improvements with respect to tremor and foot dystonia, gait, postural reflexes, mood, anxiety, and cognitive and autonomic functions.[259]

This article reports on the cases of four Parkinsonian patients who exhibited significant improvements in motor symptoms following treatment with externally applied magnetic fields of picotesla-range intensity.[260]

This article reports on two cases of fully medicated Parkinson's patients who experienced enhanced visuoperceptive functions as measured numerous drawing tests following extracranial treatment with picotesla-range magnetic fields.[261]

This article reports on the case of a 69-year-old Parkinsonian patient on full medication who experienced a marked improvement on several different drawing tests following 30 minutes of treatment with picotesla-range magnetic fields.[262]

This article reports on the case of a Parkinson's patient suffering from severe movement problems who received treatment with external artificial weak magnetic fields with a frequency of 2 Hz and intensity of 7.5 picotesla over a period of 6 minutes. Results showed a significant attenuation in disability and near total reversal of the symptoms lasting approximately 72 hours. The patient then applied equivalent magnetic fields on a daily basis at home. Sustained improvement was seen throughout an observation of one month.[263]

This article reports on the case of a 67-year-old male patient suffering from Parkinson's disease and levodopa-related motor fluctuations. Treatment with the application of external weak magnetic fields led to improvements in general Parkinsonian symptoms along with the amelioration of "on-off" symptoms.[264]

Peripheral Neuritis
In this study, patients suffering from peripheral neuritis were exposed to high-frequency electromagnetic radiation on acupuncture points. EMR was generated Electronica-EnF, Aria, and Porog devices with tunable frequencies ranging between 53 and 78 GHz. Treatments were daily and lasted 25 minutes. Results showed full restoration of nerve function in 87 percent of patients.[265]

Pneumonia
Results of this study showed that magnetic laser therapy decreased the severity of acute respiratory insufficiency and treatment course, and prevented destructive complications in children with infiltrative acute destructive pneumonia between the ages of 1 and 12 years.[266]

Post-Herpetic Neuralgia
This study found both pulsed magnetic field treatment (20-30 minutes per day) and whole body alternating current magnetic field treatment (30 minutes per day) to be effective therapies for post-herpetic neuralgia in older patients. Pulsed magnetic field treatment consisted of 0.6-T (6-kG) samarium/cobalt magnets surrounded spiral coils generating a maximum 0.1-T pulse. Pads were pasted on the sensory areas innervated the dorsal root of the spinal cord where there was scar-association pain or paresthesia. Stimuli were delivered at 280 V and 8 Hz. Alternating current magnetic field treatment involved a treatment bed consisting of 19 electrodes containing paired coils and with a maximum magnetic flux density around the electrodes of 0.08 T.[267]

Pseudoarthrosis
In this study, 92 congenital pseudoarthrosis patients received treatment with pulsing electromagnetic fields. Results indicated a 76-percent rate of lesion recovery.[270]

In this study, 34 patients with congenital pseudoarthrosis-associated infantile nonunions received treatment with pulsing electromagnetic fields. Results indicated that 50 percent experienced full healing, 21 percent experienced healing with need for protections, and 29 percent experienced failure. The majority of failures were among men with a history of early fracture. Following the demonstration of coil effects, the PEMF treatment was combined with surgical realignment, immobilization, and grafting.[271]

In this study, 29 congenital pseudoarthrosis patients received extremely-low-frequency pulsing electromagnetic fields. Results: Over 70 percent experienced full healing, 21 percent experienced healing with need for protections, and 29 percent experienced failure. The majority of failures were among men with a history of early fracture.[272]

In this article, the authors report on their own clinical use of electrodynamic field therapy in the treatment of 271 pseudoarthrosis patients over a period of 8 years. They report bony healing in 92 percent of such cases.[273]

This study examined the effects of pulsed electromagnetic fields on 91 patients with congenital pseudoarthrosis of the tibia. Results showed an overall success rate of 72 percent.[274]

Results of this study indicated that treatment with pulsed electromagnetic fields had beneficial effects in children suffering from congenital pseudoarthrosis.[275]

Results of this study indicated that pulsed electromagnetic fields (72 Hz) can be an effective therapy for patients suffering from lesions associated with congenital pseudoarthroses when treatment is combined with appropriate orthopedic management.[276]

Psychiatric Disorders

Noting the well-established dangers associated with electroconvulsive therapy, the author, in this theoretical article, argues that transcranial magnetic stimulation should be looked at as an alternative psychiatric treatment. The author asserts that TMS has several advantages over ECT in that it is painless, noninvasive, and more effective on deep structures of the brain.[277]

Respiratory Problems

Results of this study showed that the use of low-frequency magnetic fields helped to prevent and treat critically ill patients suffering from pyoinflammatory bronchopulmonary complications, and to prevent such complications as well.[278]

This article reports on the case of a schizophrenic patient suffering from respiratory difficulties associated with neuroleptic withdrawal. Treatment using external application of picotesla-range magnetic fields quickly attenuated the severity of such problems.[279]

Sexual Disorders

Results of this placebo-controlled study showed that magnetotherapy exhibited beneficial effects with respect to cavernous blood flow in male patients suffering from sexual problems.[280]

This study examined the effects of a combination pulsing magnetic field (PMF)/vacuum therapy in the treatment of impotence. Vacuum therapy consisted of the penis being placed into a hermetic cylinder with a negative pressure of 180-260 mmHg for 10-12 minutes per exposure for a total of 12-15 exposures. PMF therapy consisted of the same length and number of exposures, with 6 Hz, 30 mT being applied to the penile area at the same time as vacuum therapy. Results showed that, following the combination therapy, sexual function was restored in about 71 percent of patients, was improved in 17 percent, and did not change in 17 percent. For those patients receiving vacuum therapy only, the numbers were 51, 24, and 24 percent, respectively.[281]

This double-blind, placebo-controlled study examined the effects of weak magnetic fields in men suffering from various sexual disorders, including decreased erection and premature ejaculation. The three different magnetic stimulators used included the "Biopotenzor," "Eros," and "Bioskan-1" devices. All patients wore one of the three devices for a 3-week period. Results showed full restoration of sexual function in 38 percent of patients in the Biopotenzor group, 31 percent in the Eros group, 36 percent in the Bioskan-1 group, and in just 15 percent of the controls. Improvements in sexual function were seen among 42 percent, 39 percent, 47 percent, and 18 percent, respectively.[282]

Sleep Disorders

Results of this double-blind, placebo-controlled study indicated that low-energy-emission therapy significantly improved sleeping patterns among patients suffering

from chronic psychophysiological insomnia. Therapy was administered 3 times per week, always in late afternoon and for 20 minutes, over a period of 4 weeks.[284]

This double-blind, placebo-controlled study examined the effects of low-energy emission therapy (27 MHz amplitude-modulated electromagnetic fields) in patients suffering from insomnia. Treatment consisted of 3 exposures per week over a 4-week period. Results showed significant increases in total sleep time among patients in the treatment group relative to controls.[285]

This review article notes that studies have found low-energy emission therapy to be effective in the treatment of chronic insomnia, and suggests that it may also be of value for patients suffering from generalized anxiety disorders.[286]

Spinal Cord Injury
Results of this study found that exposure to constant magnetic fields improved healing in rats with experimentally induced spinal cord injury, and in human patients suffering from spinal cord trauma as well.[287]

This study examined the effects of functional magnetic stimulation used to treat spinal cord injury in seven male patients. Results showed the treatment to be an effective noninvasive approach.[288]

Stroke
Results of this study demonstrated that treatment with sinusoidal modulated currents coupled with transcerebral magnetic fields proved more effective than either therapy on its own in the treatment of stroke patients during the period of early rehabilitation.[290]

This study found that exposure to pulsed electromagnetic fields following focal cerebral ischemia provided significant protection against neuronal damage, in rabbits.[291]

Results of this study pointed to the efficacy of magnetic field therapy in the treatment of patients suffering from a variety of conditions associated with different brain vascular diseases.[292]

Synovitis
This study examined the effects of magnetic fields on synovitis in rats. Results showed that the placement of a 3800-gauss magnet on the bottom of the cage significantly suppressed inflammation associated with the condition, relative to controls.[293]

Tendonitis
Results of this double-blind, placebo-controlled study indicated that pulsed electromagnetic field therapy exhibited significant beneficial effects in the treatment of patients suffering from persistent rotator cuff tendonitis.[294]

Tourette's Syndrome
This article reports on the case of a 6-year-old boy suffering from Tourette's syndrome who experienced improvements in visuoconstructional and visuomotor skills, along with more general symptomatic improvements, following the extracranial application of electromagnetic fields in the picotesla range of intensity.[295]

Tuberculosis

This study examined the efficacy of millimeter waves combined with conventional drug treatment in patients suffering from tuberculosis. MW therapy consisted of 10 exposures of the thymus area for 60 minutes per day using a "Yavor" apparatus (6.4 or 7.1 mm wavelength). Controls received drug treatment only. Results indicated that while MW/drug therapy had no effect on the clearance of the tuberculosis bacteria, it did facilitate clinical recovery faster than drug therapy alone.[296]

This study examined the effects of extremely-high-frequency therapy as administered via a "Yav'-1-7,1" apparatus (7.1 mm wavelength) on tuberculosis patients. Results showed a 25-percent improvement in patients receiving the therapy as a pathogenic treatment. A 72-percent improvement rate was seen among patients who received the therapy as treatment for concurrent diseases.[297]

This controlled study examined the effects of constant elastic electromagnetic fields (40 mT) in patients suffering from pulmonary tuberculosis. Therapy consisted of 30-45 minute daily application of either a single magnet or a pair of magnets placed on the chest at an area high in skin temperature over a 1-3 month period. When coupled with conventional treatments, one third of patients receiving the constant electromagnetic fields experienced healing of tubercular cavities. contrast, only one fifth of patients receiving conventional treatment alone experienced such effects. One month into combination treatment, there was no evidence of mycobacterium tuberculosis in the sputum in half the patients relative to only one third of controls.[298]

Ulcers (Gastric and Duodenal)

Results of this study showed that the administration of millimetric electromagnetic waves helped to normalize blood properties, subsequently improving the effectiveness of more conventional gastric and duodenal ulcer treatment.[303]

This study examined the effects of millimeter wave (MW) therapy in 317 patients suffering from duodenal and gastric ulcers. MW therapy consisted of 30 minutes per day exposure of the epigastric area ("Yav'-1" apparatus, 10 mW/cm2, 5.6-mm wavelength) until complete ulcer cicatrization was achieved. Results showed a 95-percent rate of ulcer cicatrization in patients receiving the treatment compared to a 78-percent rate in controls. One year follow up showed a 54-percent ulcer recurrence rate in MW-treated patients, which was markedly less than the rate for controls.[306]

This controlled study found extremely-high-frequency therapy to be an effective treatment in patients suffering from duodenal ulcers. Treatment consisted of 5-10 exposures, lasting 20-30 minutes, and making use of the G4-142 apparatus (53.5-70.0 GHz frequency range).[308]

This study compared the effects of traditional drug treatment (TDT) to those of microwave resonance therapy (MRT) in patients suffering from duodenal ulcers. Results indicated the mean hospital stay for patients in the TDT group was approximately 22 days. Throughout this period, ulcers healed in 38 percent of patients, were reduced in 17 percent, showed no change in 43 percent, and increased in 2 percent. No pain relief was seen in 32 percent. contrast, mean discharge time for patients in the MRT group was approximately 12 days. Pain was generally stopped in 3-6 days. Complete healing occurred in 81 percent, a decrease was seen in 16 percent, and ulcer

size did not change in just 3 percent. Remission occurred in 98 percent of such patients.[310]

In this study, microwave resonance therapy (MRT) was administered to 2642 patients suffering from duodenal ulcers and to 78 with gastric ulcers. Treatment involved the use of a G4-142 device (53.6-78.3 GHz, less than 2 mW/cm2 incident power) as well as "Electronika-KVCh" and "Porog-1" devices. Patients received 6-12 daily exposures of between 20 and 25 minutes. Results showed a total ulcer cicatrization in 80 percent of patients, and arrested pain syndrome in almost 100 percent.[311]

Ulcers (Trophic)

This study examined the use of magnetotherapy coupled with galvanization and intratissue electrophoresis in 86 patients suffering from trophic ulcers. A "Potok-1" apparatus with a density of current equal to 0.05-0.1 mA/cm2 was used to create an electrical field. The "MAG-30" apparatus for low-frequency magnetotherapy with induction of 30 mT and area of exposure of 20 cm2 was applied to a trophic ulcer site at the same time. Results led the authors to conclude that magnetogalvanotherapy is the recommended treatment for trophic ulcers of the lower extremities.[299]

This review article discusses the theoretical and clinical applications of magnetic field therapy in the treatment of trophic ulcers of the lower limbs.[300]

This study looked at the effects of conventional trophic ulcer treatment alone and in combination with alternating magnetic field (AMF) or constant magnetic field (CMF) exposures in a group of patients suffering from various types of trophic ulcers of the lower limbs. Results showed an average hospital stay of 31 days in the CMF group and 27 days in the AMF group, compared to 40 days among controls. Based on these and related findings, the authors suggest combination AMF therapy to be most effective.[304]

This placebo-controlled study examined the effects of pulsed electromagnetic fields in the treatment of decubitus ulcers in hospitalized elderly patients with stage II and III pressure ulcers. Patients received daily PEMF stimulation in conjunction with conventional treatment for a period of up to 5 weeks. The findings were that combined PEMF/conventional treatment was superior to conventional treatment and to the placebo received controls.[305]

Results of this study found that the daily use of electromagnetolaser therapy decreased mean healing time in patients suffering from lower extremity trophic ulcers to approximately 18 days, compared with approximately 26 days in patients receiving laser therapy alone.[307]

This double-blind, placebo-controlled study found that treatment with nonthermal pulsed electromagnetic energy (PEMET) accelerated would healing in spinal cord injury patients suffering from stage II and III pressure ulcers. PEMET treatment consisted of pulsed 27.12-MHz energy produced via a Diapulse device. Energy was delivered the use of a treatment head placed in wound dressings, in 30-minute periods twice a day for 12 weeks or until sores healed.[312]

This double-blind, placebo-controlled study examined the effects of pulsed electromagnetic fields (75 Hz, 2.7 mT) applied 4 hours per day for a maximum of 3

months coupled with conventional therapies in patients suffering from trophic lesions. Results showed the treatment to have positive effects, but only on small lesions.[314]

Urinary Problems

In this article, the authors report on their successful use of magnetic-laser therapy in inflammations of the urinary system in a urological clinic setting.[316]

Results of this study showed magnetolaser therapy to be effective in the treatment of patients suffering from urolithiasis (stone formation). Magnetolaser therapy involved the use of a Milita device with a 35-mT magnetic field.[317]

Wound Healing

This study examined the effects of static magnetic fields on postoperative wounds in 21 patients undergoing plastic surgery. Magnetic patches ranging in thickness from 1 to 6 mm, and 2450 to 3950 G field strength were administered over the area of operation for a total of 48 hours. Thirteen patients received the magnets after pain or edema had appeared and 8 received them prophylactically. Results showed a decrease in pain, edema, and coloration in approximately 60 percent of patients. Such symptoms disappeared entirely in 75 percent.[321]

Results of this study indicated that treatment with pulsating electromagnetic field either alone or in combination with laser therapy exhibited healing effects with respect to peripheral nerve lesions and general wound healing relative to controls.[322]

This double-blind, placebo-controlled study examined the effects of a magnetic treatment device taped over the carpal tunnel against wrist pain sustained at work among a group of turkey plant employees. Results showed that the device was effective in alleviating such pain and that it was free of side effects.[323]

Results of this controlled study showed that low-frequency pulsed electromagnetic fields produced significant beneficial cutaneous wound healing effects in rats.[324]

This double-blind, placebo-controlled study found that treatment with nonthermal pulsed radiofrequency energy accelerated would healing in spinal cord injury patients suffering from stage II and III pressure ulcers. RF treatment consisted of pulsed 27.12-MHz energy produced via a Diapulse device, with energy delivered via a treatment head placed in wound dressings, in 30-minute periods twice a day for 12 weeks or until sores healed.[325]

After a discussion of the mechanics involved in the use of pulsed electromagnetic energy in the treatment of disease, the author discusses findings from recent studies pointing to the therapy's effectiveness with respect to the treatment of acute soft-tissue lesions.[326]

Results of this placebo-controlled study indicated that low-intensity continuous microwave radiation administered over a period of 7 days was effective in treating post-operative purulent wounds associated with abdominal surgery.[327]

Results of this study showed that combined magneto/laser therapy reduced inflammation and wound suppuration, and enhanced tissue healing significantly in patients suffering from gunshot wounds relative to conventional treatment only.[328]

Noting that pulsed electromagnetic fields have been used in bone healing for more than 20 years, this review article cites recent results from both animal and human studies pointing to the efficacy of PEMF in the treatment of soft-tissue injuries as well.[329]

This double-blind study examined the effects of postoperative nonthermal pulsed high-frequency electromagnetic fields on edema formation and bruise healing in boys undergoing orchidopexy. Treatment involved exposure 3 times daily for the first 4 days following surgery. Significant effects with respect to rate of bruise resolution were reported in patients receiving the treatment relative to controls.[330]

This controlled study examined the effects of pulsed electromagnetic fields in patients suffering from chronic productive inflammation or orbital tissue. PEMF treatment consisted of 7-10 minute daily exposures over a period of 10 days. Controls received conventional treatment only. Both groups showed good improvement, but patients treated with the PEMFs recovered significantly faster than did controls.[331]

ENDNOTES

1. R. Sandyk, "Alzheimer's Disease: Improvement of Visual Memory and Visuoconstructive Performance Treatment with Picotesla Range Magnetic Fields," International Journal of Neurosci, 76(3-4), June 1994, p. 185-225.

2. R. Sandyk, et al., "Age-related Disruption of Circadian Rhythms: Possible Relationship to Memory Impairment and Implications for Therapy with Magnetic Fields," International Journal of Neurosci, 59(4), August 1991, p. 259-262.

3. A. Bellosi & R. Berget, "Pulsed Magnetic Fields: A Glimmer of Hope for Patients Suffering from Amyotrophic Lateral Sclerosis," Second World Congress for Electricity and Magnetism in Biology and Medicine, 8-13 June 1997, Bologna, Italy.

4. A.A. Pilla & L. Kloth, "Effect of Pulsed Radio Frequency Therapy on Edema in Ankle Sprains: A Multisite Double-Blind Clinical Study," Second World Congress for Electricity and Magnetism in Biology and Medicine, 8-13 June 1997, Bologna, Italy, p. 300.

5. Y. Mizushima, et al., "Effects of Magnetic Field on Inflammation," Experientia, 31(12), December 15, 1975, p. 1411-1412.

6. J.C. Reynolds, "The Use of Implantable Direct Current Stimulation in Bone Grafted Foot and Ankle Arthrodeses: A Retrospective Review," Second World Congress for Electricity and Magnetism in Biology and Medicine, 8-13 June 1997, Bologna, Italy.

7. T. Zizic, et al., "The Treatment of Rheumatoid Arthritis of the Hand with Pulsed Electrical Fields," Second World Congress for Electricity and Magnetism in Biology and Medicine, 8-13 June 1997, Bologna, Italy.

8. V.D. Grigor'eva, et al., "Therapeutic Use of Physical Factors in Complex Therapy of Patients with Psoriatic Arthritis," Vopr Kurortol Fizioter Lech Fiz Kult, (6), 1995, p. 48-51.

9. B.Y. Drozdovski, et al., "Use of Magnetolaser Therapy with an AMLT-01 Apparatus in Complex Therapy for Rheumatoid Arthritis," Fiz Med, 4(1-2), 1994, p. 101-102.

10. E.A. Shlyapok, et al., "Use of Alternating Low-Frequency Magnetic Fields in Combination with Radon Baths for Treatment of Juvenile Rheumatoid Arthritis," Vopr Kurortol Fizioter Lech Fiz Kult, 4, 1992, p. 13-17.

11. V.D. Grigor'eva, et al., "Therapeutic Application of Low-Frequency and Constant Magnetic Fields in Patients with Osteoarthritis Deformans and Rheumatoid Arthritis," Vopr Kurortol Fizioter Lech Fiz Kult, 4, 1980, p. 29-35.

12. V.A. Machekhin, et al., "A New Method for Treating Chronic Blepharitis Using Magnetic Compounds and an Alternating Magnetic Field," Vestn Oftalmol, 109(4), July-September 1993, p. 16-18.

13. V.A. Machekhin, et al., "A New Method for Treating Chronic Blepharitis Using Magnetic Compounds and an Alternating Magnetic Field," Vestn Oftalmol, 109(4), 1993, p. 16-18.

14. C.A. Bassett, et al., "Treatment of Therapeutically Resistant Non-unions with Bone Grafts and Pulsing Electromagnetic Fields," Journal of Bone Joint Surg, 64(8), October 1982, p. 1214-1220.

15. C.A. Bassett, et al., "Treatment of Ununited Tibial Diaphyseal Fractures with Pulsing Electromagnetic Fields," Journal of Bone Joint Surg, 63(4), April 1981, p. 511-523.

16. M.W. Meskens, et al., "Treatment of Delayed Union and Nonunion of the Tibia Pulsed Electromagnetic Fields. A Retrospective Follow-up," Bull Hosp Jt Dis Orthop Inst, 48(2), Fall 1988, p. 170-175.

17. C.A. Bassett, "The Development and Application of Pulsed Electromagnetic Fields (PEMFs) for Ununited Fractures and Arthrodeses," Clin Plast Surg, 12(2), April 1985, p. 259-277.

18. G.K. Frykman, et al., "Treatment of Nonunited Scaphoid Fractures Pulsed Electromagnetic Field and Cast," Journal of Hand Surg, 11(3), May 1986, p. 344-349.

19. E. Betti, et al., "Effect of Electromagnetic Field Stimulation on Fractures of the Femoral Neck. A Prospective Randomized Double-Blind Study," Second World Congress for Electricity and Magnetism in Biology and Medicine, 8-13 June 1997, Bologna, Italy.

20. V. Sollazzo, et al., "Effects of Pulsed Electromagnetic Fields (PEMF) on Human Osteoblast-Like Cells and Human Chondryocytes: An In Vitro Study," Second World

Congress for Electricity and Magnetism in Biology and Medicine, 8-13 June 1997, Bologna, Italy.

21. J.T. Rya, et al., "Combine Magnetic Fields Stimulate Insulin-Like Growth Factor Production Potential Transcription Factor-Dependent Mechanism(s)," Second World Congress for Electricity and Magnetism in Biology and Medicine, 8-13 June 1997, Bologna, Italy.

22. C.A. Bassett, et al., "Pulsing Electromagnetic Field Treatment in Ununited Fractures and Failed Arthrodeses," JAMA, 247(5), February 5, 1982, p. 623-628.

23. G.C. Traina, "Electromagnetic Field Stimulation of Osteotomies," Second World Congress for Electricity and Magnetism in Biology and Medicine, 8-13 June 1997, Bologna, Italy.

24. J. Nepola, et al., "Effect of Exposure Time on Stimulation of Healing in the Rabbit Tibial Osteotomy Model a Time Varying Pulsed Electromagnetic Field, and a Combined Magnetic Fields," Second World Congress for Electricity and Magnetism in Biology and Medicine, 8-13 June 1997, Bologna, Italy.

25. G. Borsalino, et al., "Electrical Stimulation of Human Femoral Intertrochanteric Osteotomies. Double-Blind Study," Clin Orthop, (237), December 1988, p. 256-263.

26. M. Marcer, et al., "Results of Pulsed Electromagnetic Fields (PEMFs) in Ununited Fractures after External Skeletal Fixation," Clin Orthop, (190), November 1984, p. 260-265.

27. O. Wahlstrom, "Stimulation of Fracture Healing with Electromagnetic Fields of Extremely Low Frequency (EMF of ELF)," Clin Orthop, (186), June 1984, p. 293-301.

28. A.W. Dunn & G.A. Rush, 3d, "Electrical Stimulation in Treatment of Delayed Union and Nonunion of Fractures and Osteotomies," Southern Medical Journal, 77(12), December 1984, p. 1530-1534.

29. G. Fontanesi, et al., "Slow Healing Fractures: Can They be Prevented? (Results of Electrical Stimulation in Fibular Osteotomies in Rats and in Diaphyseal Fractures of the Tibia in Humans)," Italian Journal of Orthop Traumatol, 12(3), September 1986, p. 371-385.

30. F. Rajewski & W. Marciniak, "Use of Magnetotherapy for Treatment of Bone Malunion in Limb Lengthening. Preliminary Report," Chir Narzadow Ruchu Ortop Pol, 57(1-3), 1992, p. 247-249.

31. R.B. Simonis, et al., "The Treatment of Non-union Pulsed Electromagnetic Fields Combined with a Denham External Fixator," Injury, 15(4), January 1984, p. 255-260.

32. L. Sedel, et al., "Acceleration of Repair of Non-unions Electromagnetic Fields," Rev Chir Orthop Reparatrice Appar Mot, 67(1), 1981, p. 11-23.

33. J.C. Mulier & F. Spaas, "Out-patient Treatment of Surgically Resistant Non-unions Induced Pulsing Current - Clinical Results," Arch Orthop Trauma Surg, 97(4), 1980, p. 293-297.

34. C.A. Bassett, "Conversations with C. Andrew L. Bassett, M.D. Pulsed Electromagnetic Fields. A Noninvasive Therapeutic Modality for Fracture Nonunion (Interview)," Orthop. Review, 15(12), 1986, p. 781-795.

35. B.T. O'Connor, "Treatment of Surgically Resistant Non-unions with Pulsed Electromagnetifc Fields," Reconstr Surg Traumatology, 19, 1985, p. 123-132.

36. A. Bassett, "Therapeutic Uses of Electric and Magnetic Fields in Orthopedics," in D.O. Carpenter & S. Ayrapetyan, (eds.), Biological Effects of Electric and Magnetic Fields. Volume II: Beneficial and Harmful Effects, San Diego: Academic Press, 1994, p. 13-48.

37. A.A. Goldberg, "Computer Analysis of Data on More than 11,000 Cases of Ununited Fracture Submitted for Treatment with Pulsing Electromagnetic Fields," Bioelectrical Repair and Growth Society, Second Annual Meeting, 20-22 September 1982, Oxford, UK, p. 61.

38. O. Wahlstrom, "Electromagnetic Fields Used in the Treatment of Fresh Fractures of the Radius," Bioelectrical Repair and Growth Society, Second Annual Meeting, 20-22 September 1982, Oxford, UK, p. 26.

39. G.B. Gromak & G.A. Lacis, "Evaluations of the Efficacy of Using a Constant Magnetic Field in Treatment of Patients with Traumas," in I. Detlav, (ed.), Electromagnetic Therapy of Injuries and Diseases of the Support-Motor Apparatus. International Collection of Papers, Riga, Latvia: Riga Medical Institute, 1987, p. 88-95.

40. A.F. Lynch & P. MacAuley, "Treatment of Bone Non-Union Electromagnetic Therapy," Ir Journal of Med Sci, 154(4), 1985, p. 153-155.

41. C.A.L. Bassett, "Historical Overview of PEM-Assisted Bone and Tissue Healing," Bioelectromagnetics Society, 10th Annual Meeting, 19-24 June 1988, Stamford, CT, p. 19.

42. V.M. Iurlov, et al., "The Efficacy of the Use of Low-Frequency Electromagnetic Fields in Chronic Bronchitis," Voen Med Zh, 3, 1989, p. 35-36.

43. R.R. Raylman, et al., "Exposure to Strong Static Magnetic Field Slows the Growth of Human Cancer Cells in Vitro," Bioelectromagnetics, 17(5), 1996, p. 358-363.

44. N.G. Bakhmutskii, et al., "The Assessment of the Efficacy of the Effect of a Rotational Magnetic Field on the Course of the Tumor Process in Patients with Generalized Breast Cancer," Sov Med, (7), 1991, p. 25-27.

45. N.G. Bakhmutskii, et al., "The Growth Dynamics of Walker Carcinosarcoma During Exposure to a Magnetic Eddy Field," Vopr Onkol, 37(6), 1991, p. 705-708.

46. Y. Omote, "An Experimental Attempt to Potentiate Therapeutic Effects of Combined Use of Pulsing Magnetic Fields and Antitumor Agents," Nippon Geka Gakkai Zasshi, 89(8), August 1988, p. 1155-1166.

47. L.S. Ogorodnikova, et al., "Morphological Criteria of Lung Cancer Regression Under the Effect of Magnetotherapy," Vopr Onkol, 26(1), 1980, p. 28-34.

48. C.K. Chou, et al., "Development of Electrochemical Treatment at the City of Hope," Second World Congress for Electricity and Magnetism in Biology and Medicine, 8-13 June 1997, Bologna, Italy.

49. S. Yunqin, et al., "Electrochemical Therapy in the Treatment of Malignant Tumours on the Body Surface," European Journal of Surgery, 160(574 Suppl), 1994, p. 41-43.

50. D.V. Miasoedov, et al., "Experience with the Use of Microwave Resonance Therapy as a Modifying Factor in Oncological Therapy," Abstracts of the First All-Union Symposium with International Participation, May 10-13, 1989, Kiev, Ukraine, p. 313-315.

51. U. Randoll & R.M. Pangan, "The Role of Complex Biophysical-Chemical Therapies for Cancer," Bioelectrochem Bioenerg, 27(3), 1992, p. 341-346.

52. V.G. Andreev, et al., "Radiomodifying Effect of a Constant Magnetic Field in Radiation Therapy of Patients with Cancer of the Throat," Fizicheskaia Meditzina, 4(1-2), 1994, p. 92.

53. V. Smirnova, "Anti-Tumorigenic Action of an Eddy Magnetic Field," Vrach, 2, 1994, p. 25-26.

54. N.G. Bakhmutskii, et al., "A Case of Successful Treatment of a Patient with Breast Cancer Using a Rotating Electromagnetic Field," Soviet Medicine, 8, 1991, p. 86-87.

55. V.A. Lubennikov, et al., "First Experience in Using a Whole-Body Magnetic Field Exposure in Treating Cancer Patients," Vopr Onkol, 41(2), 1995, p. 140-141.

56. I. Rodin, et al., "Use of Low-Intensity Eddy Magnetic Field in the Treatment of Patients with Skin Lymphomas," Voen Med Zh, 317(12), 1996, p. 32-34.

57. M.A. Dudchenko, et al., "The Effect of Combined Treatment with the Use of Magnetotherapy on the Systemic Hemodynamics of Patients with Ischemic Heart Disease and Spinal Osteochondrosis," Lik Sprava, (5), May 1992, p. 40-43.

58. E.M. Vasil'eva, et al., "The Effect of a Low-frequency Magnetic Field on Erythrocyte Membrane Function and on the Prostanoid Level in the Blood Plasma of Children with Parasystolic Arrhythmia," Vopr Kurortol Fizioter Lech Fiz Kult, (2), March-April 1994, p. 18-20.

59. Y.B. Kirillov, et al., "Magnetotherapy in Obliterating Vascular Diseases of the Lower Extremities," Vopr Kurortol Fizioter Lech Fiz Kult, (3), May-June 1992, p. 14-17.

60. O.M. Konova & M.A. Khan, "The Effect of a Low-frequency Alternating Magnetic Field on the Autonomic Nervous System in Children with Primary Arterial Hypertension," Vopr Kurortol Fizioter Lech Fiz Kult, (2), March-April, 1996, p. 8-10.

61. V.S. Zadionchenko, et al., "Prognostic Criteria of the Efficacy of Magnetic and Magnetic-laser Therapy in Patients with the Initial Stages of Hypertension," Vopr Kurortol Fizioter Lech Fiz Kult, (1), January-February 1997, p. 8-11.

62. R.T. Gordon & D. Gordon, "Selective Resolution of Plaques and Treatment of Atherosclerosis Biophysical Alteration of "Cellular" and "Intracellular" Properties," Medical Hypotheses, 7(2), February 1981, p. 217-229.

63. S.G. Ivanov, et al., "The Magnetotherapy of Hypertension Patients," Ter Arkh, 62(9), 1990, p. 71-74.

64. R. Cadossi, "Protective Effect of Electromagnetic Field Exposure on Acute Soft Tissue Ischaemic Injury," Second World Congress for Electricity and Magnetism in Biology and Medicine, 8-13 June 1997, Bologna, Italy.

65. I.E. Ganelina, et al., "Electromagnetic Radiation of Extremely High Frequencies in Complex Therapy for Severe Stenocardia," Millimetrovie Volni v Biologii I Meditcine, (4), 1994, p. 17-21.

66. T.V. Golovacheva, "EHF Therapy in Complex Treatment of Cardiovascular Diseases," Millimeter Waves in Medicine and Biology, 10th Russian Symposium with International Participation, April 24-26, 1995, Moscow, Russia, p. 29-31.

67. V.V. Orzeshkovskii, et al., "Clinical Application of Electromagnetic Fields," in I.G. Akoevs & V.V. Tiazhelov, (eds.), Topics of Experimental and Applied Bioelectromagnetics. A Collection of Research Papers, Puschcino, USSR, USSR Academy of Sciences, Biological Sciences Research Center, 1983, p. 139-147.

68. N.N. Naumcheva, "Effect of Millimeter Waves on Ischemic Heart Disease Patients," Millimetrovie Volni v Biologii I Meditcine, (3), 1994, p. 62-67.

69. A.P. Dovganiuk & A.A. Minenkov, "The Use of Physical Factors in Treating Chronic Arterial Insufficiency of the Lower Limbs," Vopr Kurortol Fizioter Lech Fiz Kult, (5), 1996, p. 7-9.

70. V.V. Orzheshovski, et al., "Efficacy of Decimeter-Band Waves and Magnetophore Therapy in Patients with Hypertension," Vrach Delo, (1), 1982, p. 65-67.

71. L.L. Orlov, et al., "Indications for Using a New Magnetotherapeutic Method in Arterial Hypertension," Soviet Medicine, (8), 1991, p. 23-24.

72. V.V. Orzheshkovskii, et al., "The Treatment of Hypertension Patients with Electromagnetic and Magnetic Fields," Vrach Delo, (10), 1991, p. 81-82.

73. I.G. Alizade, et al., "Magnetic Treatment of Autologous Blood in the Combined Therapy of Hypertensive Patients," Vopr Kurortol Fizioter Lech Fiz Kult, (1), 1994, p. 32-33.

74. E.V. Rolovlev, "Treatment of Essential Hypertension Patients an Alternating Magnetic Field Puncture," All-Union Symposium: Laser and Magnetic Therapy in Experimental and Clinical Studies, June 16-18, 1993, Obninsk, Kaluga Region, Russia, p. 221-223.

75. I.N. Danilova & E.M. Orekhova, "Application of Sinusoidally-Modulated Currents in the Electrosleep Therapeutic Procedure," Vopr Kurortol Fizioter Lech Fiz Kult, (6), 1989, p. 9-13.

76. S.G. Ivanov, et al., "Use of Magnetic Fields in the Treatment of Hypertensive Disease," Vopr Kurortol Fizioter Lech Fiz Kult, (3), 1993, p. 67-69.

77. S.G. Ivanov, "The Comparative Efficacy of Nondrug and Drug Methods of Treating Hypertension," Ter Arkh, 65(1), 1993, p. 44-49.

78. T.A. Kniazeva & R. Arutiunian, "The Effect of Low-Frequency Magnetic Field and General Iodobromide Baths with the Presence of Molecular Iodine on the Blood Coagulation Processes and the Central Hemodynamics of Patients after an Aortocoronary passs," Vopr Kurortol Fizioter Lech Fiz Kult, 4, 1990, p. 11-15.

79. L.N. Budkar, et al., "Magnetolaser Therapy in Treatment of Ischemic Heart Disease and Heart Rhythm Disorders," Doktor Lending, 4(13), 1996, p. 10-13.

80. L.L. Orlov, et al., "Effect of a Running Pulse Magnetic Field on Some Humoral Indices and Physical Capacity in Patients with Neurocirculatory Hypo- and Hypertension," Biofizika, 41(4), 1996, p. 944-948.

81. T.A. Kniazeva, "The Efficacy of Low-Intensity Exposures in Hypertension," Vopr Kurortol Fizioter Lech Fiz Kult, 1, 1994, p. 8-9.

82. A.G. Kakulia, "The Use of Sonic Band Magnetic Fields in Various Diseases," Vopr Kurortol Fizioter Lech Fiz Kult, 3, 1982, p. 18-21.

83. S.S. Gabrielian, et al., "Use of Low-Frequency Magnetic Fields in the Treatment of Patients with Atherosclerotic Encephalopathy," Vopr Kurortol Fizioter Lech Fiz Kult, 3, 1987, p. 36-39.

84. N.A. Temur'iants, et al., "Use of Millimeter-Wave Therapy for Increasing of Nonspecific Resistivity in Children Suffering from Frequent and Long-Lasting Catarrhal Diseases," Millimetrovie Volni v Biologii I Meditcine, 3, 1994, p. 85-88.

85. E.I. Pasynkov, et al., "Therapeutic Use of Alternating Magnetic Field in the Treatment of Patients with Chronic Diseases of the Veins of the Lower Limbs," Vopr Kurortol Fizioter Lech Fiz Kult, 5, 1976, p. 16-19.

86. A.P. Dovganiuk, "Balneologic and Physical Therapy of Chronic Venous Insufficiency of Extremities," Vopr Kurortol Fizioter Lech Fiz Kult, 2, 1995, p. 48-49.

87. Y.B. Kirillov, et al., "Magnetotherapy for Obliterative Disease of the Vessels of the Legs," Vopr Kurortol Fizioter Lech Fiz Kult, 3, 1992, p. 14-17.

88. E.N. Grebnev & A.V. Shumskii, "Immunocorrective Therapy in the Treatment of Chronic Herpetic Stomatitis Using Magnetic Autohemotherapy," Stomatologiia (Mosk), 74(2), 1995, p. 37-39.

89. R.G. Schwartz, "Electric Sympathetic Block: An Advanced Clinical Technique for the Treatment of Complex Acute Chronic Pain," Second World Congress for Electricity and Magnetism in Biology and Medicine, 8-13 June 1997, Bologna, Italy.

90. N.V. Ordzhonikidze, et al., "Experimental Validation of the Efficacy of Laser-magnetic Therapy for Chronic Placental Insufficiency," Akush Ginekol (Mosk), (1), 1994, p. 18-21.

91. T.N. Leont'eva, "Ultrasonic Ethmoidotomy Combined with Intracavitary Magnetotherapy in Chronic Polypous Ethmoiditis," Vestn Otorinolaringol, (4), July-August 1990, p. 38-41.

92. S.P. Seregin & A.V. Panov, "The Correction of Prostatic Hemodynamics in Chronic Prostatitis," Vopr Kurortol Fizioter Lech Fiz Kult, (2), March-April 1997, p. 20-21.

93. A.D. Deineka & A.M. Pozdniakov, "Magnetolaser Therapy of Constitutional Hyperbilrubinemia," Fiz Med, 4(1-2), 1994, p. 104-105.

94. A.A. Verzin, "Action of Gentamycin Against a Background of Magnetotherapy of the Anterior Chamber in a Traumatic Infected Erosion of the Cornea," Antibiotiki, 27(10), October 1982, p. 774-775.

95. M.A. Darendeliler, et al., "Light Maxillary Expansion Forces with the Magnetic Expansion Device. A Preliminary Investigation," European Journal of Orthod, 16(6), December 1994, p. 479-490.

96. A. Breunig & T. Rakosi, "The Treatment of Open Bite Using Magnets," Fortschr Kieferorthop, 53(3), June 1992, p. 179-186.

97. F.G. Sander & A. Wichelhaus, "Can Magnets or Additional Intermaxillary Forces Improve the Mode of Action of Jumping-the-bite Plates?" Fortschr Kieferorthop, 55(6), December 1994, p. 279-289.

98. D. Zaffe, et al., "PEMFS Improve Bone Adaptation in Orthodontically Treated Rabbits," Second World Congress for Electricity and Magnetism in Biology and Medicine, 8-13 June 1997, Bologna, Italy.

99. V.E. Kriokshina, et al., "Use of Micromagnets in Stomatology," Magnitologiia, (1), 1991, p. 17-20.

100. L.C. Rhodes, "The Adjunctive Utilization of Diapulse Therapy (Pulsed High Peak Power Electromagnetic Energy) in Accelerating Tissue Healing in Oral Surgery," Q National Dental Association, 40(1), 1981, p. 4-11.

101. V. Hillier-Kolarov & N. Pekaric-Nadj, "PEMF Therapy as an Additional Therapy for Oral Diseases," European Bioelectromagnetics Association, 1st Congress, 23-25 January 1992, Brussels, Belgium.

102. A.A. Kunin, et al., "Magnetolaser Therapy in Complex Treatment of Periodontal Diseases," Fiz Med, 4(1-2), 1994, p. 103-104.

103. M.T. Kirkcaldie, et al., Transcranial Magnetic Stimulation as Therapy for Depression and Other Disorders," Aust N Z J Psychiatry, 31(2), April 1997, p. 264-272.

104. R. Sandyk, et al., "Magnetic Felds and Seasonality of Affective Illness: Implications for Therapy," International Journal of Neurosci, 58(3-4), June 1991, p. 261-267.

105. C. Haag, et al., "Transcranial Magnetic Stimulation. A Diagnostic Means from Neurology as Therapy in Psychiatry?" Nervenarzt, 68(3), March 1997, p. 274-278.

106. T. Zyss, "Will Electroconvulsive Therapy Induce Seizures: Magnetic Brain Stimulation as Hypothesis of a New Psychiatric Therapy," Psychiatr Pol, 26(6), November-December 1992, p. 531-541.

107. G.V. Morozov, et al., "Extremely-High Frequency Electromagnetic Radiation in the Treatment of Neurotic Depression in Women," Millimeter Waves in Medicine and Biology. Digest of Papers of the 10th Russian Symposium with International Participation, April 24-26, 1995, Moscow, Russia, p. 49-51.

108. G.V. Morozov, et al., "Treatment of Neurotic Depression with a Help of Extremely High Frequency Electromagnetic Radiation," Zh Nevropatol Psikhiatr Im S S Korsakova, 96(6), 1996, p. 28-31.

109. A. Conca, et al., "Transcranial Magnetic Stimulation: A Novel Antidepressive Strategy?" Neuropsychobiology, 34(4), 1996, p. 204-207.

110. V.P. Adaskevich, "Effectiveness of the Use of Millimeter-Range Electromagnetic Radiation in Complex Treatment of Atopic Dermatitis Patients," Millimetrovie Volni v Biologii I Meditcine, (3), 1994, p. 78-81.

111. I.B. Kirillovm, et al., "Magentotherapy in the Comprehensive Treatment of Vascular Complications of Diabetes Mellitus," Klin Med, 74(5), 1996, p. 39-41.

112. M.I. Shved & A.P. Dudnik, "The Medical Effect of Magnetic-laser Therapy in Patients with Diabetic Angiopathies of the Lower Extremities," Lik Sprava, (10-12), October-December 1996, p. 155-158.

113. R.A. Kuliev & R.F. Babaev, "A Magnetic Field in the Combined Treatment of Suppurative Wounds in Diabetes Mellitus," Vestn Khir Im I I Grek, 148(1), January 1992, p. 33-36.

114. R.A. Kuliev, et al., "Treatment of Suppurative Wounds in Patients with Diabetes Mellitus Magnetic Field and Laser Irradiation," Khirurgliia, (7-8), 1992, p. 30-33.

115. V.A. Lebedev, "Treatment of Neurogenic Dysfunction of the Bladder and Enuresis in Children with a SKENAR Apparatus," Vopr Kurortol Fizioter Lech Fiz Kult, (4), 1995, p. 25-26.

116. L.G. Vassilenko, "EHF Electromagnetic Radiation in Treat-ment of Obliterating Diseases of Inferior Limb Vessels," Second World Congress for Electricity and Magnetism in Biology and Medicine, 8-13 June 1997, Bologna, Italy.

117. D.I. Tarasov, et al., "Effectiveness of Local Magnetic Field of the Acoustic Frequency in the Treatment of Patients with Acute Inflammatory Diseases of the Larynx," Vestn Otorinolaringol, (6), November-December 1995, p. 11-15.

118. A.D. Burigina, et al., "Electromagnetic Waves in Complex Therapy of Children with Birth Trauma: Effects of Ultra-High-Frequency Electric Fields on Central Hemodynamics and the Shoulder Plexus," Vopr Kurortol Fizioter Lech Fiz Kult, (4), 1992, 35-38.

119. M. Damirov, et al., "Magnetic-Infared-Laser Therapeutic Apparatus (MILTA) in Treatment of Patients with Endometriosis," Vrach, 12, 1994, p. 17-19.

120. V.M. Strugatskii, et al., "A Permanent Magnetic Field in the Combined Treatment of Acute Endometritis After an Artificial Abortion," Vopr Kurortol Fizioter Lech Fiz Kult, (6), November-December 1996, p. 21-24.

121. P.A. Anninos, et al., "Magnetic Stimulation in the Treatment of Partial Seizures," International Journal of Neurosci, 60(3-4), October 1991, p. 141-171.

122. G.D. Antimonii & R.A. Salamov, "Action of a Modulated Electromagnetic Field on Experimentally Induced Epileptiform Brain Activity in Rats," Biull Eksp Biol Med, 89(2), February 1980, p. 145-148.

123. M.J. McLean, et al., "Therapeutic Efficacy of a Static Magnetic Device in Three Animal Seizure Models: Summary of Experience," Second World Congress for Electricity and Magnetism in Biology and Medicine, 8-13 June 1997, Bologna, Italy.

124. F. Sartucci, et al., "Human Exposure to Oscillating Magnetic Fields Produces Changes in Pain Perception and Pain-Related Somatosensory Evoked Potentials," Second World Congress for Electricity and Magnetism in Biology and Medicine, 8-13 June 1997, Bologna, Italy.

125. R. Sandyk & P.A. Anninos, "Attenuation of Epilepsy with Application of External Magnetic Fields: A Case Report," International Journal of Neurosci, 66(1-2), September 1992, p. 75-85.

126. R. Sandyk & P.A. Anninos, "Magnetic Fields Alter the Circadian Periodicity of Seizures," International Journal of Neurosci, 63(3-4), April 1992, p. 265-274.

127. V.I. Bulynin, et al., "The Restoration of Esophageal Patency in Cicatricial Strictures Using Magnetic Elements," Grud Serdechnososudistaia Khir, (3), May-June 1993, p. 53-56.

128. E.A. Luzhnikov, et a., "The Use of Magnetic Hemotherapy in Combined Detoxification in Acute Exogenous Poisonings," Klin Med, 73(3), 1995, p. 37-40.

129. L.M. Petrukhina, et al., "Effect of a Decimeter Wave Electromagnetic Fields on the Motor Function of the Stomach in Children with Strong Gastroduodenitis," Vopr Kurortol Fizioter Lech Fiz Kult, (1), 1987, p. 54-56.

130. O.V. Bukanovich, et al., "Sinusoidally-Modulated Currents in the Therapy of Chronic Gastroduodenitis in Children," Vopr Kurortol Fizioter Lech Fiz Kult, 2, 1996, p. 22-26.

131. L. Navratil, et al., "Possible Therapeutic Applications of Pulsed Magnetic Fields," Cas Lek Cesk, 132(19), October 11, 1993, p. 590-594.

132. J. Jerabek, "Pulsed Magnetotherapy in Czechoslovakia--A Review," Rev Environ Health, 10(2), April-June 1994, p. 127-134.

133. A.A. Pilla, "State of the Art in Electromagnetic Therapeutics: Soft Tissue Applications," Second World Congress for Electricity and Magnetism in Biology and Medicine, 8-13 June 1997, Bologna, Italy.

134. G. Annaratone, et al., "Magnetotherapy in Clinical and Ambulatory Practice," Minerva Med, 74(14-15), April 7, 1983, p. 823-833.

135. C.A. Bassett, "Fundamental and Practical Aspects of Therapeutic Uses of Pulsed Electromagnetic Fields (PEMFs)," Crit Rev Biomed Eng, 17(5), 1989, p. 451-529.

136. C.A. Bassett, "Beneficial Effects of Electromagnetic Fields," Journal of Cell Biochem, 51(4), April 1993, p. 387-393.

137. A.G. Pakhomov, "Millimeter Wave Medicine in Russia: A Review of Literature," Infrared Lasers and Millimeter Waves Workshop: The Links Between Microwaves and Laser Optics, January 21-22, 1997, Brooks Air Force Base, Texas.

138. S.D. Schvchenko, et al., "Experience with Treating Some Orthopedic Diseases with Millimeter Range Radiation of Nonthermal Intensity," Millimeter Waves in Medicine and Biology. Digest of Papers of the 11th Russian Symposium with International Participation, April 21-24, 1997, Zvenigorod, Moscow Region, Russia, p. 33-35.

139. A.M. Begue-Simon & R.A. Drolet, "Clinical Assessment of the Rhumart System based on the Use of Pulsed Electromagnetic Fields with Low Frequency," International Journal of Rehabil Research, 16(4), 1993, p. 323-327.

140. Y.L. Arzumanov, "An Overview of the Third Workshop 'Use of Millimeter Waves in Medicine,'" Millimetrovie Volni v Biologii i Meditcine, (3), 1994, p. 104-107.

141. N. Gilinskaya & L.V. Zobina, "Magnetic Field Application for the Treatment of Vascular Diseases of the Brain and Eyes," in Y.A. Kholodov & N.N. Lebedeva (eds.), Problems of Electromagnetic Neurobiology, Moscow, Nauka, 1988, p. 94-98.

142. R.A. Drolet, "Rhumart Therapy: A Non-invasive Cell Regeneration Ion and Anti-Inflammatory Therapy Using LF-EM Fields," Bioelectromagnetics Society, 4th Annual Meeting, 28 June-2 July 1982, Los Angeles, CA, p. 45.

143. A. Zaslavskii, et al., "A Low-frequency Impulse Apparatus for Physical Therapy 'Infita'," Med Tehk, 5, 1994, p. 39-41.

144. V.M. Bogoliubov & L.A. Skurikhina, "Therapeutic Application of Constant and Low-Frequency Magnetic Fields," Vopr Kurortol Fizioter Lech Fiz Kult, (2), 1979, p. 65-72.

145. V.I. Kovalchuk, et al., "Use of Extremely-Low-Frequency Magnetic Fields in Clinical Practice," Fizicheskaia Meditzina, 4(1-2), 1994, p. 87.

146. S.A. Schastnyi, et al., "A Contact-Free, Biologically Adequate Electromagnetic Stimulation of Repair Regeneration of Osseous, Cartilaginous, and Muscular Tissues in Children," Vestn Ross Akad Med Nauk, (3), 1994, p. 38-42.

147. J. Jerabek, "Pulsed Magnetotherapy in Czechoslovakia: A Review," First World Congress for Electricity and Magnetism in Biology and Medicine, 14-19 June 1992, Lake Buena Vista, FL, p. 81.

148. N.M. Suvorova, "Treatment of Chronic Inflammatory Diseases of the Female Genitals Permanent Magnetic Field," Akush Ginekol, (9), 1977, p. 62-63.

149. Bisvas, et al., "Possibilities of Magnetotherapy in Stabilization of Visual Function in Patients with Glaucoma," Vestn Oftalmol, 112(1), Jauary-March 1996, p. 6-8.

150. V.D. Grigor'eva & N.E. Fedorova, "New Methodological Aspects in the Use of Cryotherapy, Ultrasound, Magnetotherapy and Therapeutic Physical Exercise in the Rehabilitation of Gonarthrosis Patients," Vopr Kurortol Fizioter Lech Fiz Kult, (2), March-April 1996, p. 26-28.

151. W.S. Maddin, et al., "The Biological Effects of a Pulsed Electrostatic with Specific Reference to Hair: Electrotrichogenesis," International Journal of Dermatology, 29(6), 1990, p. 446-450.

152. O. Grunner, et al., "Cerebral Use of a Pulsating Magnetic Field in Neuropsychiatry Patients with Long-term Headache," EEG EMG Z Elektroenzephalogr Verwandte Geb, 16(4), December 1985, p. 227-230.

153. R. Sandyk, "The Influence of the Pineal Gland on Migraine and Cluster Headaches and Effects of Treatment with picoTesla Magnetic Fields," International Journal of Neurosci, 67(1-4), November-December 1992, p. 145-171.

154. B.M. Popov & T.A. Al'shanskaya, "Use of Traditional and Non-traditional Methods in the Treatment of Headache," Millimeter Waves in Medicine and Biology. Digest of Papers of the 11th Russian Symposium with International Participation, April 21-24, 1997, Zvenigorod, Moscow Region, Russia, p. 68-71.

155. A. Prusinski, et al., "Pulsating Electromagnetic Field in the Therapy of Headache," Hungarian Symposium on Magnetotherapy, 2nd Symposium, May 16-17, 1987, Szekesfehervar, Hungary, p. 163-166.

156. A. Prusinksi, et al., "Pulsating Electromagnetic Field in the Therapy of Headache," Journal of Bioelectr., 7(1), 1988, p. 127-128.

157. J. Giczi & A. Guseo, "Treatment of Headache Pulsating Electromagnetic Field a Preliminary Report," Hungarian Symposium on Magnetotherapy, 2nd Symposium, May 16-17, 1987, Szekesfehervar, Hungary, p. 74-76.

158. L. Lazar & A. Farago, "Experiences of Patients Suffering from Migraine-Type Headache Treated with Magnetotherapy," Hungarian Symposium on Magnetotherapy, 2nd Symposium, May 16-17, 1987, Szekesfehervar, Hungary, p. 137-140.

159. V.V. Aleschenko & I.O. Pisanko, "EHF-Therapy for Hemophylic Arthropathy and Hemarthroses of the Knee Joint," Millimeter Waves in Medicine and Biology. Digest of Papers of the 10th Russian Symposium with International Participation, April 24-26, Moscow, Russia, 1995, p. 61-63.

160. A.A. Shul'diakov, et al., "Electromagnetic Radiation of Millimeter Range in Treatment of Children with Acute Viral Hepatitis," Millimeter Waves in Medicine and Biology, 10th Russian Symposium with International Participation, April 24-26, 1995, Moscow, Russia, p. 21-23.

161. I.A. Il'inskii, et al., "Experience with the Use of Glucocorticosteroids and Magnetic Fields in the Intensive Therapy of Severe Forms of Viral Hepatitis," Soviet Medicine, 9, 1978, p. 72-74.

162. V.V. Krasnov & A.I. Shilenok, "Magnetotherapy of Hepatitis A and B in Children," Pediatriia, 10, 1991, p. 54-57.

163. K. Perjes, et al., "Effect of Magnetotherapy on Recovery After Herniated Disk Surgery," Hungarian Symposium on Magnetotherapy, 2nd Symposium, May 16-17, 1987, Szekesfehervar, Hungary, p. 159-162.

164. G. Gualtieri, et al., "The Effect Pulsed Electromagnetic Field Stimulation on Patients Treated of Hip Revesions with Trans-Femoral Approach," Second World Congress for Electricity and Magnetism in Biology and Medicine, 8-13 June 1997, Bologna, Italy.

165. K. Konrad, "Therapy with Pulsed Electromagnetic Fields in Aseptic Loosening of Total Hip Protheses: A Prospective Study," Clinical Rheumatology, 15(4), 1996, p. 325-328.

166. A. Zaslavskii, et al., "'ELEMAGS' Apparatus and Clinical Experience with its Use for Treatment of Hypoacusis and Otalgia in Children," Med Tekh, (2), 1995, p. 40-41.

167. E.A. Stepanov, et al., "The Treatment of Intestinal Fistulae in Children Applying a -pass Anastomosis Using Magnetic Devices," Khirurgiia, (11-12), November-December 1992, p. 93-95.

168. E. Riva Sanseverino, et al., "Therapeutic Effects of Pulsed Magnetic Fields on Joint Diseases," Panminerva Med, 34(4), October-December 1992, p. 187-196.

169. V.E. Rodoman, et al., "The Effect of Magnetic and Laser Therapy on the Course of an Experimental Inflammatory Process in the Kidneys," Urol Nefrol (Mosk), (2), March-April 1993, p. 17-20.

170. A.A. Li, et al., "The Use of an Impulse Magnetic Field in the Combined Therapy of Patients with Stone Fragments in the Upper Urinary Tract," Vopr Kurortol Fizioter Lech Fiz Kult, (3), May-June 1994, p. 22-24.

171. V.A. Kiyatkin, "Pulsed Magnetic Field in Therapy of Patients with Secondary Chronic Pyelonephritis," Second World Congress for Electricity and Magnetism in Biology and Medicine, 8-13 June 1997, Bologna, Italy.

172. L.U. Bigliani, "The Use of Pulsing Electromagnetic Fields to Achieve Arthrodesis of the Knee Following Failed Total Knee Arthroplasty. A Preliminary Report," Journal of Bone Joint Surg, 65(4), April 1983, p. 480-485.

173. L.D. Dorogaia & G.F. Uchaikin, "Use of Microwave Resonance Therapy in Complex Treatment of Laryngotracheitis in Children," Pediatriia, (1), 1995, p. 55-57.

174. A.E. Kucherenko & V.I. Shevchuk, "Treatment of Diseases of Limb Stumps with Alternating Current Magnetic Field," Klin Khir, 7, 47-49.

175. G. Laszlo & T. Tanay, "Comparative Evaluation of Magnetotherapy Treatment in Patients Suffering from Locomotor Disease," Hungarian Symposium on Magnetotherapy, 2nd Symposium, 16-17 May 1987, Szekesfehervar, Hungary, p. 128-136.

176. I.M. Garber, "A Combined Method for Treating the Neurological Manifestations of Lumbar Osteochondrosis with a Low-Frequency Magnetic Field and the Vacuum Phonophoresis of Hydrocortisone and Trilon B," Vopr Kurortol Fizioter Lech Fiz Kult, (2), 1990, p. 61-62.

177. L.V. Iashchenko, "Low-Frequency Magnetic Fields in the Combined Therapy of Inflammatory Lung Diseases," Probl Tuberk, 3, 1988, p. 53-56.

178. I.V. Khamaganova, et al., "The Use of a Pulsed Magnetic Field in the Treatment of Lupus Erythematosus," Ter Arkh, 67(10), 1995, p. 84-87.

179. V.D. Sidorov & S.B. Pershin, "Immunomodulating Effect of Microwaves and Ultrahigh Frequency Electric Field in Patients with Systemic Lupus Erythmatosus," Bioelectrochem Bioenerg, 30, 1993, p. 327-330.

180. V.D. Sidorov, et al., "The Immunomodulating Effect of Microwaves and of an Ultrahigh-Frequency Electrical Field in Patients with Systemic Lupus Erythematosus," Vopr Kurortol Fizioter Lech Fiz Kult, (4), 1991, p. 36-40.

181. M.P. Nikolaev, et al., "The Clinico-immunological Assessment of the Efficacy of Magnetic-laser Therapy in Patients with Chronic Maxillary Sinusitis," Vestn Otorinolaringol, (2), March-April 1994, p. 27-31.

182. R. Sandyk, "Rapid Normalization of Visual Evoked Potentials picoTesla Range Magnetic Fields in Chronic Progressive Multiple Sclerosis," International Journal of Neurosci, 77(3-4), August 1994, p. 243-259.

183. R. Sandyk, "Further Observations on the Effects of External picoTesla Range Magnetic Fields on Visual Memory and Visuospatial Functions in Multiple Sclerosis," International Journal of Neurosc, 77(3-4), August 1994, 203-27

184. R. Sandyk, "Successful Treatment of Multiple Sclerosis with Magnetic Fields," International Journal Neurosci, 66(3-4), October 1992, p. 237-250.

185. R. Sandyk, "Progressive Cognitive Improvement in Multiple Sclerosis from Treatment with Electromagnetic Fields," International Journal of Neurosci, 89(1-2), January 1997, p. 39-51.

186. R. Sandyk, "Resolution of Dysarthria in Multiple Sclerosis Treatment with Weak Electromagnetic Fields," International Journal of Neurosci, 83(1-2), November 1995, p. 81-92.

187. R. Sandyk, "Reversal of Alexia in Multiple Sclerosis Weak Electromagnetic Fields," International Journal of Neurosci, 83(1-2), November 1995, p. 69-79.

188. R. Sandyk, "Long Term Beneficial Effects of Weak Electromagnetic Fields in Multiple Sclerosis," International Journal of Neurosci, 83(1-2), November 1995, p. 45-57.

189. R. Sandyk, "Suicidal Behavior is Attenuated in Patients with Multiple Sclerosis Treatment with Electromagnetic Fields," International Journal of Neurosci, 87(1-2) October 1996, p. 5-15.

190. R. Sandyk, "Treatment with Electromagnetic Field Alters the Clinical Course of Chronic Progressive Multiple Sclerosis--A Case Report," International Journal of Neurosci, 88(1-2), November 1996, p. 75-82.

191. R. Sandyk, "Effect of Weak Electromagnetic Fields on Body Image Perception in Patients with Multiple Sclerosis," International Journal of Neurosci, 86(1-2), July 1996, p. 79-85.

192. R. Sandyk, "Treatment with Weak Electromagnetic Fields Attenuates Carbohydrate Craving in a Patients with Multiple Sclerosis," International Journal of Neurosci, 86(1-2), July 1996, p. 67-77.

193. R. Sandyk, "Reversal of an Acute Parkinsonian Syndrome Associated with Multiple Sclerosis Application of Weak Electromagnetic Fields," International Journal of Neurosci, 86(1-2), July 1996, p. 33-45.

194. R. Sandyk & L.C. Dann, "Resolution of Lhermitte's Sign in Multiple Sclerosis Treatment with Weak Electromagnetic Fields," International Journal of Neurosci, 81(3-4), April 1995, p. 215-224.

195. R. Sandyk & L.C. Dann, "Weak Electromagnetic Fields Attenuate Tremor in Multiple Sclerosis," International Journal of Neurosci, 79(3-4), December 1994, p. 199-212.

196. R. Sandyk, "Reversal of Visuospatial Hemi-inattention in Patients with Chronic Progressive Multiple Sclerosis Treatment with Weak Electromagnetic Fields," International Journal of Neurosci, 79(3-4), December 1994, p. 169-184.

197. R. Sandyk, "Improvement in Word-fluency Performance in Patients with Multiple Sclerosis Electromagnetic Fields," International Journal Neurosci, 79(1-2), November 1994, p. 75-90.

198. R. Sandyk & R.P. Iacono, "Improvement PicoTesla Range Magnetic Fields of Perceptual-motor Performance and Visual Memory in a Patient with Chronic Progressive Multiple Sclerosis," International Journal of Neurosci, 78(1-2), September 1994, p. 53-66.

199. R. Sandyk & R.P. Iacono, "Multiple Sclerosis: Improvement of Visuoperceptive Functions PicoTesla Range Magnetic Fields," International Journal of Neurosci, 74(1-4), January-February 1994, p. 177-189.

200. R. Sandyk, "Application of Weak Electromagnetic Fields Facilitates Sensory-motor Integration in Patients with Multiple Sclerosis," International Journal of Neurosci, 85(1-2), March 1996, p. 101-110.

201. R. Sandyk, "Treatment with Weak Electromagnetic Fields Improves Fatigue Associated with Multiple Sclerosis," International Journal of Neurosci, 84(1-4), February 1996, p. 177-186.

202. R. Sandyk, "Resolution of Partial Cataplexy in Multiple Sclerosis Treatment with Weak Electromagnetic Fields," International Journal of Neurosci, 84(1-4), February 1996, p. 157-164.

203. R. Sandyk, "Weak Electromagnetic Fields Restore Dream Recall in Patients with Multiple Sclerosis," International Journal of Neurosci, 82(1-2), May 1995, p. 113-125.

204. R. Sandyk, "Weak Electromagnetic Fields Improve Body Image Perception in Patients with Multiple Sclerosis," International Journal of Neurosci, 82(3-4), June 1995, p. 285-302.

205. R. Sandyk, "Premenstrual Exacerbation of Symptoms in Multiple Sclerosis is Attenuated Treatment with Weak Electromagnetic Fields," International Journal of Neurosci, 83(3-4), December 1995, p. 187-198.

206. R. Sandyk & K. Derpapas, "Successful Treatment of an Acute Exacerbation of Multiple Sclerosis External Magnetic Fields," International Journal of Neurosci, 70(1-2), May 1993, p. 97-105.

207. R. Sandyk & R.P. Iacono, "Resolution of Longstanding Symptoms of Multiple Sclerosis Application of PicoTesla Range Magnetic Fields," International Journal of Neurosci, 70(3-4), June 1993, p. 255-269.

208. R. Sandyk & K. Derpapas, "Magnetic Fields Normalize Visual Evoked Potentials and Brainstem Auditory Evoked Potentials in Multiple Sclerosis," International Journal of Neurosci, 68(3-4), February 1993, p. 241-253.

209. A. Guseo, "Double-Blind Treatments with Pulsating Electromagnetic Field in Multiple Sclerosis," Hungarian Symposium on Magnetotherapy, 2nd Symposium, May 16-17, 1987, Szekesfehervar, Hungary, p. 85-89.

210. A. Guseo, "Pulsing Electromagnetic Field Therapy of Multiple Sclerosis the Gyuling-Bordacs Device: Double-Blind, Cross-Over and Open Studies," Journal of Bioelectr., 6(1), 1987, p. 23-35.

211. A. Sieron, et al., "The Variable Magnetic Fields in the Complex Treatment of Neurological Diseases," European Bioelectromagnetics Association, 3rd International Congress, 29 February - 3 March 1996, Nancy, France.

212. I.E. Detlav, "The Influence of Constant and Pulsed Electromagnetic Fields on Oxidation Processes in Muscle," in I.E. Detlav, (ed.), Electromagnetic Therapy of Injuries and Diseases of the Support-Motor Apparatus. International Collection of Papers, Riga, Latvia: Riga Medical Institute, 1987, p. 12-16.

213. L. Mecseki, et al., "The Study of the Efficacy of Magnetotherapy in Peripheral Paralysis," Hungarian Symposium on Magnetotherapy, 2nd Symposium, 16-17 May 1987, Szekesfehervar, Hungary, p. 149-158.

214. D. Foley-Nolan, et al., "Low Energy High Frequency (27.12 MHZ) Therapy for Persistent Neck Pain. Double Blind Placebo Controlled Trial," Bioelectromagnetics Society, 12th Annual, June 10-14, 1990, San Antonia, TX, p. 73.

215. H. Ito & C.A. Bassett, "Effect of Weak, Pulsing Electromagnetic Fields on Neural Regeneration in the Rat," Clin Orthop, (181), December 1983, p. 283-290.

216. A.R. Raji & R.E. Bowden, "Effects of High-peak Pulsed Electromagnetic Field on the Degeneration and Regeneration of the Common Peroneal Nerve in Rats," Journal of Bone Joint Surg, 65(4), August 1983, p. 478-492.

217. M.G. Orgel, et al., "Pulsing Electromagnetic Field Therapy in Nerve Regeneration: An Experimental Study in the Cat," Plast Reconstr Surg, 73(2), February 1984, p. 173-183.

218. O.A. Krylov, et al., "The Action of an Impulse Magnetic Field on the Motor Function Recovery of the Peripheral Nerve Trunks," Vopr Kurortol Fizioter Lech Fiz Kult, (6), November-December 1991, p. 40-44.

219. A.M. Raji, "An Experimental Study of the Effects of Pulsed Electromagnetic Field (Diapulse) on Nerve Repair," Journal of Hand Surg, 9(2), June 1984, p. 105-112.

220. L.V. Zobina, et al., "Effectiveness of Magnetotherapy in Optic Nerve Atrophy. A Preliminary Study," Vestn Oftalmol, 106(5), September-October 1990, p. 54-57.

221. G. Terlaki, "Clinical Experiences Magnetotherapy," Hungarian Symposium on Magnetotherapy, 2nd Symposium, 16-17 May 1987, Szekesfehervar, Hungary, p. 175-179.

222. A.A. Skorometz, et al., "Magnetic Impulse Therapy of Patients with Spondylogenic Diseases of the Nervous System," Fizicheskaia Meditzina, 3(1-2), 1993, p. 41-43.

223. A.G. Shiman, et al., "Use of Combined Methods of Magnetoelectrotherapy in the Treatment for Polineuropathies," Vopr Kurortol Fizioter Lech Fiz Kult, (5), 1993, p, 38-41.

224. D.H. Trock, et al., "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," Journal of Rheumatology, 21(10), 1994, p. 1903-1911.

225. G. Markarov, et al., "Therapeutic Effectiveness of Infra-red Laser Ray Combined with Quasi-stationary Electromagnetic Field in Patients with Osteoarthrosis," Bioelectromagnetics Society, 16th Annual Meeting, 12-17 June 1994, Copenhagen, Denmark, p. 114-115.

226. D.H. Trock, et al., "Treatment of Osteoarthritis with Pulsed Electromagnetic Fields," Bioelectric Repair and Growth Society, Vol. XIII, 13th Annual Meeting, 10-13 October 1993, Dana Point, CA, p. 14.

227. A.J. Bollet, et al., "Treatment of Osteoarthritis with Pulsed Electromagnetic Fields," European Bioelectromagnetics Association, 2nd Congress, 9-11 December 1993, Bled Slovenia, p. 46.

228. L. Yurkiv, et al., "The Use of Changeable Magnetic Field in Treatment of Osteoarthrosis," European Bioelectromagnetics Association, 3rd International Congress, 29 February-3 March 1996, Nancy France.

229. L.L. Butenko, "The Use of Alternating Magnetic Fields in Spinal Osteochondrosis," Mechanisms of Biological Action of Electromagnetic Fields, 27-31 October 1987, Pushchino, USSR, USSR Academy of Sciences, Research Center for Biological Studies, Inst. of Biological Physics, Coordination Council of Comecon Countries and Yugoslavia for Research in the Fields of Biological Physics, p. 183.

230. N.S. Eftekhar, et al., "Osteonecrosis of the Femoral Head Treated Pulsed Electromagnetic Fields (PEMFs): A Preliminary Report," Hip, 1983, p. 306-330.

231. M. Hinsenkamp, et al., "Preliminary Results in Electromagnetic Field Treatment of Osteonecrosis," Bioelectrochem Bioenerg., 30, 1993, p. 229-236.

232. A. Zati, et al., "Effects of Pulsed Magnetic Fields in the Therapy of Osteoporosis Induced Ovariectomy in the Rat," Boll Soc Ital Biol Sper, 69(7-8), July-August 1993, p. 469-475.

233. C.T. Rubin, et al., "Prevention of Osteoporosis Pulsed Electromagnetic Fields," Journal of Bone Joint Surg, 71(3), March 1989, p. 411-417.

234. S. Mishima, "The Effect of Long-term Pulsing Electromagnetic Field Stimulation on Experimental Osteoporosis of Rats," Sangyo Ika Daigaku Zasshi, 10(1), March 1, 1988, p. 31-45.

235. F. Tabrah, et al., "Bone Density Changes in Osteoporosis-prone Women Exposed to Pulsed Electromagnetic Fields (PEMFs)," Journal of Bone Miner Res, 5(5), May 1990, p. 437-442.

236. T.W. Bilotta, et al., "The Use of Low-Frequency Low Magnitude PEMFs in Treatment of Osteoporosis," Journal of Bioelectr, 8(2), 1989, p. 316.

237. T.W. Bilotta, et al., "Influence of Pulsed Electromagnetic Fields on Post-Menopausal Osteoporosis," First World Congress for Electricity and Magnetism in Biology and Medicine, 14-19 June 1992, Lake Buena Vista, FL, p. 78.

238. G. Saveriano & S. Ricci, "Treatment of Senile Osteoporosis Caused Rachialgia with Low-Frequency PEMFs," Journal of Bioelectr, 8(2), 1989, p. 321.

239. V.V. Sunstov, "Treatment of Acute Diffuse Otitis Externa Low-Frequency Magnetic Fields," Vestn Otorinolaringol, 6, 1991, p. 35-38.

240. V.V. Kents, et al., "The Efficacy of the Combined Use of 5-fluorouracil Electrophoresis and Magnetotherapy in Experimental Pancreatitis," Vopr Kurortol Fizioter Lech Fiz Kult, (3), May-June 1994, p. 17-19.

241. A.A. Fedorov, et al., "The Use of a Low-frequency Magnetic Field in the Combined Therapy of Chronic Pancreatitis," Vopr Kurortol Fizioter Lech Fiz Kult, (5), September-October 1990, p. 28-30.

242. O.G. Savina, et al., "A Low-Frequency Pulsed Current and a Low-Intensity Laser Radiation in the Treatment of Acute Pancreatitis," Vopr Kurortol Fizioter Lech Fiz Kult, (2), 1995, p. 39-40.

243. R. Sandyk, "Brief Communication: Electromagnetic Fields Improve Visuospatial Performance and Reverse Agraphia in a Parkinsonian Patient," International Journal of Neurosci, 87(3-4), November 1996, p. 209-217.

244. R. Sandyk & R.P. Iacono, "Reversal of Visual Neglect in Parkinson's Disease Treatment with picoTesla Range Magnetic Fields," International Journal of Neurosci, 73(1-2), November 1993, p. 93-107.

245. R. Sandyk, "Magnetic Fields in the Therapy of Parkinsonism," International Journal of Neurosci, 66(3-4), October 1992, p. 209-235.

246. M.S. George, et al., "Transcranial Magnetic Stimulation: A Neuropsychiatric Tool for the 21st Century," Journal of Neuropsychiatry Clin Neurosci, 8(4), Fall 1996, p. 373-382.

247. J. Bardasano, et al., "Extracranial Device for Noninvasive Neurological Treatments with Pulsating ELF Magnetic Fields," Second World Congress for Electricity and Magnetism in Biology and Medicine, 8-13 June 1997, Bologna, Italy.

248. R. Sandyk, "Parkinsonian Micrographia Reversed Treatment with Weak Electromagnetic Fields," International Journal of Neurosci, 81(1-2), March 1995, p. 83-93.

249. R. Sandyk, "Improvement in Short-term Visual Memory Weak Electromagnetic Fields in Parkinson's Disease," International Journal of Neurosci, 81(1-2), March 1995, p. 67-82.

250. R. Sandyk, "Weak Electromagnetic Fields Reverse Visuospatial Hemi-inattention in Parkinson's Disease," International Journal of Neurosci, 81(1-2), March 1995, p. 47-65.

251. R. Sandyk, "A Drug Naive Parkinsonian Patient Successfully Treated with Weak Electromagnetic Fields," International Journal of Neurosci, 79(1-2), November 1994, p. 99-110.

252. R. Sandyk & R.P. Iacono, "Reversal of Micrographia in Parkinson's Disease Application of picoTesla Range Magnetic Fields," International Journal of Neurosci 77(1-2), July 1994, p. 77-84.

253. R. Sandyk, "Improvement in Word-fluency Performance in Parkinson's Disease Administration of Electromagnetic Fields," International Journal of Neurosci, 77(1-2), July 1994, p. 23-46.

254. R. Sandyk, "Treatment of Parkinson's Disease with Magnetic Fields Reduces the Requirement for Antiparkinsonian Medications," International Journal of Neurosci, 74(1-4), January-February 1994, p. 191-201.

255. R. Sandyk, "Reversal of a Visuoconstructional Deficit in Parkinson's Disease Application of External Magnetic Fields: A Report of Five Cases," International Journal of Neurosci, 75(3-4), April 1994, p. 213-228.

256. R. Sandyk, "Freezing of Gait in Parkinson's Disease is Improved Treatment with Weak Electromagnetic Fields," International Journal of Neurosci, 85(1-2), March 1996, p. 111-124.

257. R. Sandyk, "Improvement of Body Image Perception in Parkinson's Disease Treatment with Weak Electromagnetic Fields," International Journal of Neurosci, 82(3-4), June 1995, p. 269-283.

258. R. Sandyk, "Reversal of Visuospatial Deficit on the Clock Drawing Test in Parkinson's Disease Treatment with Weak Electromagnetic Fields," International Journal of Neurosci, 82(3-4), June 1995, p. 255-268.

259. R. Sandyk & K. Derpapas, "The Effects of External picoTesla Range Magnetic Fields on the EEG in Parkinson's Disease," International Journal of Neurosci, 70(1-2), May 1993, p. 85-96.

260. R. Sandyk & K. Derpapas, "Further Observations on the Unique Efficacy of PicoTesla Range Magnetic Fields in Parkinson's Disease," International Journal of Neurosci, 69(1-4), March-April 1993, p. 67-83.

261. R. Sandyk & R.P. Iacono, "Rapid Improvement of Visuoperceptive Functions picoTesla Range Magnetic Fields in Patients with Parkinson's Disease," International Journal of Neurosci, 70(3-4), June 1993, p. 233-254.

262. R. Sandyk, "The Effects of PicoTesla Range Magnetic Fields on Perceptual Organization and Visual Memory in Parkinsonism," International Journal of Neurosci, 73(3-4), December 1993, p. 207-219.

263. R. Sandyk, et al., "Magnetic Fields in the Treatment of Parkinson's Disease," International Journal of Neurosci, 63(1-2), March 1992, p. 141-150.

264. R. Sandyk, "Weak Magnetic Fields in the Treatment of Parkinson's Disease with the "On-off" Phenomenon," International Journal of Neurosci, 66(1-2), September 1992, p. 97-106.

265. O. Vassilenko and N.F. Vassilenko, "Use of Extremely High Frequency Electromagnetic Radiation for Treating Peripheral Neuritis," Second World Congress for Electricity and Magnetism in Biology and Medicine, 8-13 June 1997, Bologna, Italy.

266. E.A. Gaidashev, et al., "An Evaluation of the Effect of Magnetic-laser Therapy on External Respiratory Function in Complicated Forms of Acute Pneumonia in Children," Vopr Kurortol Fizioter Lech Fiz Kult, (3), May-June 1995, p. 12-14.

267. C. Kusaka, et al., "Pulse Magnetic Treatment and Whole-Body, Alternating Current Magnetic Treatment for Post-Herpetic Neuralgia," Journal of Japanese Biomagnetism Bioelectromagnetics Society, 8(2), 1995, p. 29-38.

268. J.W. Simmons, "Treatment of Failed Posterior Lumbar Interbody Fusion (PLIF) of the Spine with Pulsing Electromagnetic Fields," Clin Orthop, (193), March 1985, p. 127-132.

269. P. Navratil, et al., "Pulsed Magnetic Field in Therapy of Prostatodynias. A Pilot Study," Bioelectromagnetics Society, 16th Annual Meeting, 12-17 June 1994, Copenhagen, Denmark, p. 1994.

270. J.S. Kort, et al., "Congenital Pseudoarthrosis of the Tibia: Treatment with Pulsing Electromagnetic Fields," Clin Orthop, (165), May 1982, p. 124-137.

271. C.A. Bassett, et al., "Congenital "Pseudarthroses" of the Tibia: Treatment with Pulsing Electromagnetic Fields," Clin Orthop, (154), January-February 1981, p. 136-148.

272. C.A. Bassett, et al., "A Non-operative Salvage of Surgically-resistant Pseudarthroses and Non-unions Pulsing Electromagnetic Fields. A Preliminary Report," Clin Orthop, (124), May 1977, p. 128-143.

273. F. Lechner, et al., "Treatment of Infected Pseudoarthroses with Electrodynamic Field Therapy," Fortschr Med, 97(20), May 24, 1979, p. 943-949.

274. C.A. Bassett & M. Schink-Ascani, "Long-term Pulsed Electromagnetic Field (PEMF) Results in Congenital Pseudarthrosis," Calcif Tissue Int, 49(3), September 1991, p. 216-220.

275. M.L. Sutcliffe & A.A. Goldberg, "The Treatment of Congenital Pseudoarthrosis of the Tibia with Pusling Electromagnetic Fields: A Survey of 52 Cases," Clinical Orthop, (166), 1982, p. 45-57.

276. J.S. Kort & C.A.L. Bassett, "Role of Electricity in the Treatment of Congenital Pseudoarthrosis of the Tibia," Reconstr Surg Traumatol, 19, 1985, p. 140-146.

277. T. Zyss, "Deep Magnetic Brain Stimulation - The End of Psychiatric Electroshock Therapy?" Medical Hypotheses, 43(2), 1994, p. 69-74.

278. G.A. Mozhaev & IIu Tikhonovskii, "The Prevention and Treatment of Suppurative-inflammatory Complications in the Bronchopulmonary System During Prolonged Artificial Ventilation," Anesteziol Reanimatol, (4), July-August 1002, p. 47-51.

279. R. Sandyk & K. Derpapas, "Successful Treatment of Respiratory Dyskinesia with picoTesla Range Magnetic Fields," International Journal of Neurosci, 75(1-2), March 1994, p. 91-102.

280. I.I. Gorpinchenko, "The Use of Magnetic Devices in Treating Sexual Disorders in Men," Lik Sprava, (3-4), March-April 1995, p. 95-97.

281. I.V. Karpukhin & V.A. Bogomol'nii, "Local Vacuum-Magnetotherapy of Impotency Patients," Vopr Kurortol Lech Fiz Kult, (2), 1996, p. 38-40.

282. I.I. Gorpinchenko, "The Use of Magnetic Devices in Treating Sexual Disorders in Men," Lik Sprava, (3-4), 1995, p. 95-97.

283. T.U. Gorgiladze & B.M. Kogan, "A New Method of Treatment of a Dry Kerato-Conjunctivitis in Sjogren's Syndrome," Oftalmol Zh, (1), 1996, p. 38-40.

284. R. Hajdukovic, et al., "Effects of Low Energy Emission Therapy (LEET) on Sleep Structure," First World Congress for Electricity and Magnetism in Biology and Medicine, 14-19 June 1992, Lake Buena Vista, FL, p. 92.

285. M. Erman, et al., "Low-Energy Emission Therapy (LEET) Treatment for Insomnia," Bioelectromagnetics Society, 13th Annual Meeting, 23-27 June 1991, Salt Lake City, UT, p. 69.

286. C. Guilleminault & B. Pasche, "Clinical Effects of Low Energy Emission Therapy," Bioelectromagnetics Society, 15th Annual Meeting, 13-17 June 1993, Los Angeles, CA, p. 84.

287. E.V. Tkach, et al., "Characteristics of the Effect of a Constant Electromagnetic Field on Reparative Processes in Spinal Cord Injuries," Zh Nevropatol Psikhiatr, 89(5), 1989, p. 41-44.

288. M.K. Sheriff, et al., "Neuromodulation of Detrusor Hyper-reflexia Functional Magnetic Stimulation of the Sacral Roots," British Journal of Urology, 78(1), July 1996, p. 39-46.

289. L.L. Orlov, et al., "Running Pulse Magnetic Field in Treating Stenocardia," Biofizika, 41(4), 1996, p. 949-952.

290. F.E. Gorbunov, et al., "The Effect of Combined Transcerebral Magnetic and Electric Impulse Therapy on the Cerebral and Central Hemodynamic Status of Stroke Patients in the Early Rehabilitation Period," Vopr Kurortol Fizioter Lech Fiz Kult, (3), May-June 1996, p. 21-24.

291. G. Grant, et al., "Protection Against Focal Cerebral Ischemia Following Exposure to a Pulsed Electromagnetic Field," Bioelectromagnetics, 15(3), 1994, p. 205-216.

292. N.Y. Gilinskaia, "Magnetic Fields in Treatment of Vascular Diseases of the Brain," Magnitologiia, 1, 1991, p. 13-17.

293. A. Weinberger, et al., "Treatment of Experimental Inflammatory Synovitis with Continuous Magnetic Field," Isr Journal of Med Sci, 32(12), December 1996, p. 1197-1201.

294. A. Binder, et al., "Pulsed Electromagnetic Field Therapy of Persistent Rotator Cuff Tendinitis. A Double-blind Controlled Assessment," Lancet, 1(8379), March 31, 1984, p. 695-698.

295. R. Sandyk, "Improvement of Right Hemispheric Functions in a Child with Gilles de la Tourette's Syndrome Weak Electromagnetic Fields," International Journal of Neurosci, 81(3-4), April 1995, p. 199-213.

296. A. Khomenko, et al., "Use of Millimeter-Range Electromagnetic Radiation in Complex Therapy for Pulmonary Tuberculosis," Millimetrovie Volni v Biologii I Meditcine, (3), 1994, p. 53-61.

297. T.V. Kalinina & V.D. Churaev, "Expense with the Use of the EHF-Therapy at Ryasan' Regional Clinical TB Dispensary," Millimetrovie Volni v Biologii i Meditcine, (4), 1994, p. 52-53.

298. A.S. Solov'ena, et al., "Use of Constant Magnetic Field for Increasing the Effectiveness of Chemotherapy in Patients with Pulmonary Tuberculosis," Probl Tuberk, 8, 1987, p. 53-56.

299. A.V. Alekseenko, et al., "Use of Magnetic Therapy Combined with Galvanization and Tissue Electrophoresis in the Treatment of Trophic Ulcers," Klin Khir, (7-8), 1993, p. 31-34.

300. A. Sieron, et al., "Use of Magnetic Field in Treatment of Trophic Leg Ulcers," Pol Tyg Lek, 46(37-39), September 1991, p. 717-719.

301. TIu Kravtsova, et al., "The use of Magnetic Puncture in Patients with Duodenal Peptic Ulcer," Vopr Kurortol Fizioter Lech Fiz Kult, (1), January-February 1994, p. 22-24.

302. J. Carion, et al., "New Therapeutic Measures for the Treatment of Ulcers," Phlebologie, 31(4), October-December 1978, p. 339-342.

303. M.V. Poslavskii, et al., "Treatment of Peptic Ulcer Electromagnetic Irradiation of the Millimetric Range," Sov Med, (1), 1989, p. 29-31.

304. I.G. Sukhotnik, "Comparative Effectiveness of Using Constant and Alternating Magnetic Fields in the Treatment of Trophic Ulcers," Vest Khir, 144(6), 1990, p. 123-124.

305. S. Comorosan, et al., "The Effect of Diapulse Therapy on the Healing of Decubitus Ulcer," Romanian Journal of Physiol, 30(1-2), 1993, p. 41-45.

306. M.V. Poslavsky, et al., "Experience with Application of Millimeter-Range Radiation for Treatment and Prophylaxis of Stomach and Duodenal Ulcer," Vopr Kurortol Fizioter Lech Fiz Kult, (4), 1989, p. 31-36.

307. F.V. Galimzianov, "Laser and Electromagnetolaser Therapy for Trophic Ulcers of the Lower Extremities in Chronic Venous Insufficiency," Vestn Khir Im I I Grek, 152(5-6), 1994, p. 70-72.

308. M.V. Teppone, et al., "Extremely-High Frequency Therapy of Duodenal Ulcer," Klin Med, 69(10), 1991, p. 74-77.

309. J.E. Kenkre, et al., "A Randomized Controlled Trial of Electromagnetic Therapy in the Primary Care Management of Venous Leg Ulceration," Family Pract, 13(3), 1996, p. 236-241.

310. S.S. Dudka, et al., "A Comparative Assessment of the Efficacy of Drug Therapy and Microwave Resonance Therapy for Ulcerative Disease of the Duodenum," Fundamental and Applied Aspects of the Use of Millimeter Electromagnetic Radiation in Medicine. Abstracts of the 1st All-Union Symposium with International Participation, May 10-13, 1989, Kiev, Ukraine, p. 195-197.

311. V.A. Kutzenok, "Microwave Resonance Therapy of Stomach and Duodenal Ulcers," Fundamental and Applied Aspects of the Use of Millimeter Electromagnetic Radiation in Medicine. Abstracts of the 1st All-Union Symposium with International Participation, May 10-13, 1989, Kiev, Ukraine, p. 192-193.

312. C.A. Salzberg, et al., "The Effects of Non-Thermal Pulsed Electromagnetic Energy on Wound Healing of Pressure Ulcers in Spinal Cord-Injured Patients: A Randomized, Double-Blind Study," Wounds: A Compendium of Clinical Research and Practice, 7(1), 1995, p. 11-16.

313. T. Kravtzova, et al., "Efficacy of Magnetic Puncture Treatment of Patients Duodenal Ulcers," Doktor Lending, 4(13), 1996, p. 22-24.

314. M. Jeran, et al., "PEMF Stimulation of Skin Ulcers of Venous Origin in Humans: Preliminary Report of a Double Blind Study," Journal of Bioelectr, 6(2), 1987, p. 181-188.

315. M.J. Stiller, et al., "A Portable Pulsed Electromagnetic Field (PEMF) Device to Enhance Healing of Recalcitrant Venous Ulcers: A Double-Blind, Placebo-Controlled Clinical Trial," British Journal of Dermatology, 127(2), 1992, p. 146-154.

316. O.B. Loran, et al., "Magnetic-laser Therapy in Inflammatory and Posttraumatic Lesions of the Urinary System," Urol Nefrol (Mosk), (5), September-October 1996, p. 10-14.

317. V.P. Avdoshin, et al., "Assessment of Magnetolaser Therapy in Comparison with Other Methods of Treatment of Patients with Urolithiasis," Fiz Med, 4(1-2), 1994, p. 102-103.

318. M. Karczewska, "Use of Magnetic Therapy for Treatment of Early Symptoms of Vascular-type Vibration Syndrome in Forestry Workers," Med Pr, 47(4), 1996, 373-381.

319. A.E. Mal'tsev, "The Magnetic Amplipulse Therapy of Vestibular Dysfunctions of Vascular Origin Using the Sedaton Apparatus," Vopr Kurortol Fizioter Lech Fiz Kult, (1), January-February 1994, p. 16-19.

320. S. Saha, et al., "Effect of Electrical Stimulation of Wound Healing: A Review," Second World Congress for Electricity and Magnetism in Biology and Medicine, 8-13 June 1997, Bologna, Italy.

321. D. Man, et al., "Effect of Permanent Magnetic Field on Postoperative Pain and Wound Healing in Plastic Surgery," Second World Congress for Electricity and Magnetism in Biology and Medicine, 8-13 June 1997, Bologna, Italy.

322. B. Vukovic-Jankovic, et al., "Peripheral Nerve Regeneration Stimu-lated Pulsating Electromagnetic (PEMF) Field and Laser," Second World Congress for Electricity and Magnetism in Biology and Medicine, 8-13 June 1997, Bologna, Italy.

323. M.J. McLean, et al., "Treatment of Wrist Pain in the Work Place with a Static

Magnetic Device - Interim Report of a Clinical Trial," Second World Congress for Electricity and Magnetism in Biology and Medicine, June 8-13, Bologna, Italy.

324. O. Patino, et al., "Pulsed Electromagnetic Fields in Experimental Cutaneous Wound Healing in Rats," Journal of Burn Care Rehabil, 17(6 PT 1), 1996, p. 528-531.

325. C.A. Salzberg, et al., "The Effects of Non-Thermal Pulsed Electromagnetic Energy on Wound Healing of Pressure Ulcers in Spinal Cord-Injured Patients: A Randomized, Double-Blind Study," Ostomy Wound Manage, 41(3), 1995, p. 42-51.

326. G.C. Coats, "Pulsed Electromagnetic (Short-Wave) Energy Therapy," British Journal of Sports Medicine, 23(4), 1989, p. 213-216.

327. N.N. Korpan & T. Saradeth, "Clinical Effects of Continous Microwave for Postoperative Septic Wound Treatment: A Double-Blind Controlled Trial," American Journal of Surgery, 170(3), 1995, p. 271-276.

328. N. Bairamov, et al., "Magnetolaser Therapy in Complex Treatment of Gunshot Wounds," All-Union Symposium: Laser and Magnetic Therapy in Experimental and Clinical Studies, 16-18 June 1993, Obnisk, Kaluga Region, Russia, p. 184-185.

329. B.F. Sisken & J. Walker, "Therapeutic Aspects of Electromagnetic Fields for Soft-Tissue Healing," in M. Blank, (ed.), Electromagnetic Fields: Biological Interactions and Mechanisms, Washington, D.C.: American Chemical Society, 1995, p. 277-285.

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

331. L.S. Teren'eva, et al., "Treatment of Chronic Productive Inflammation of Orbital Tissues with a Pulsed Electromagnetic Field," Oftalmol Zh, 1, 1996, p. 1-5.