

Discussion on the Theory of the Physiological Effects of the Nikken PalmMag Device

copyright © 2009 Nu-Magnetics, Inc.

Devices that produce time-varying magnetic fields are not new. In fact, intentionally or not, people are bombarded by time-varying magnetic fields all the time. From common household appliances to electric power transmission lines, sources of electromagnetic field (EMF) radiation are ubiquitous and constantly growing in numbers in our modern society. Even before the discovery of electricity EMFs were present in nature during every lightning storm. So then, how do these invisible energy fields affect life on this planet? And more specifically, how do they affect us humans? Although much controversy has arisen in recent years over the possible deleterious effects of EMFs from power lines, microwave ovens, and cell phones, this discussion will focus on the clinically verified positive effects of EMFs from devices specifically designed for therapeutic purposes.

Medical research applications of EMF began almost simultaneously with Michael Faraday's discovery of electromagnetic induction in the late 1700s. This was one of the hallmark discoveries of physics in mankind's history and has led to the invention of numerous electromagnetic devices, which are an inextricable part of modern society, as we know it today. Faraday's Law basically states that a magnetic field is created whenever an electric current passes through a conductor, and this magnetic field will induce an electric current in a neighboring conductor as the magnetic field moves across the conductor. The key here is movement of the magnetic field relative to a conductor or vice versa. While a conductor is conventionally thought of as a piece of copper wire, in reality a conductor is anything that allows the free flow of charged particles whether they be electrons or ions. With this in mind, in an unconventional sense, the entire human body can be thought of as one large conductor since it is composed mostly of water, which is replete with dissolved salts and minerals producing trillions of ions. On a smaller scale, the various components of the human body act as conductors to one degree or another. In fact, the function of the entire human nervous system relies on ionic conduction through the nerve membrane. So then one can predict an interaction between moving magnetic fields and the human body, according to Faraday's Law with absolute certainty. The question is to what degree is this interaction significant and therapeutically beneficial.

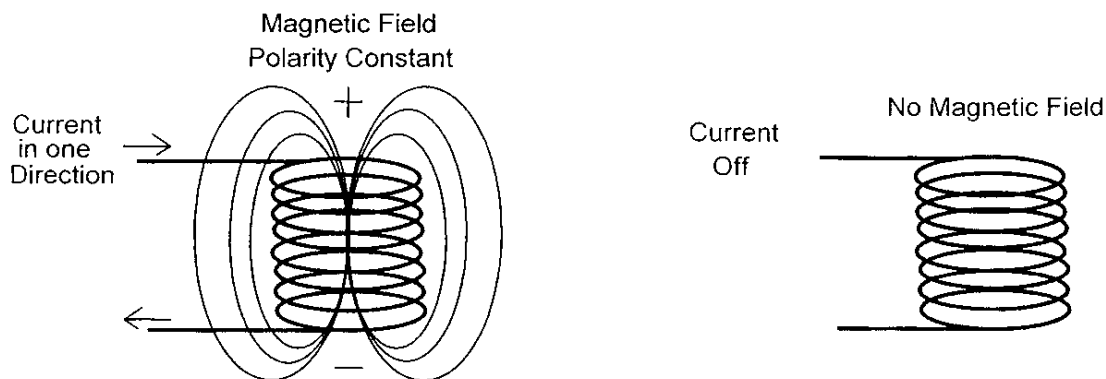
Most of today's medical EMF devices use relatively large levels of electromagnetic energy. In this discussion, however, we will focus on the nonionizing portion of the electromagnetic spectrum, particularly at low levels, which is where the PalmMag operates. An EMF is classified as ionizing if its energy is high enough to dislodge electrons from an atom or molecule. Gamma rays, and X-rays are strongly ionizing in biological matter and, for this reason, prolonged exposure to such rays is harmful. Nonionizing EMF medical applications may be classified according to whether they are thermal (heat producing in biological tissue) or non-thermal. Thermal applications of nonionizing radiation include RF hyperthermia, laser and RF surgery, and RF diathermy. In this respect, the PalmMag would be considered a nonionizing, non-thermal device. In fact, most devices used in magnetic therapy are of the nonionizing and non-thermal type. The term non-thermal is used with two different meanings in the medical and scientific literature. Biologically (or medically) non-thermal means that it "causes no significant gross tissue heating." Physically (or scientifically) non-thermal means "below the thermal noise limit at physiological temperatures." The energy level of thermal noise is much lower than that required to cause heating of tissue; thus, any physically non-thermal application is automatically biologically non-thermal.

In magnetic therapy there are basically two well-known types of EMFs. As previously stated they are Pulsed Electromagnetic Fields (PEMF) and Alternating Current or Sinusoidal Electromagnetic Fields (AC EMF). PEMFs are generated by pulsing current through a conductor, normally a coil. This pulsing effect is produced by simply turning the current on and off. Although the duration of the pulsing effect can vary with each on and off cycle, generally the pulsing rate remains constant at a set frequency until changed by the operator. A magnetic field is generated simultaneously from the current flow and mimics the frequency and intensity of the current, which produced it. AC EMFs are similar to PEMFs with the exception that AC EMFs are generated by AC current, i.e., current that continually reverses direction at a periodic rate. The magnetic field "blossoms" from the conductor coil which carries the current in both PEMF and AC EMF devices. This can be likened to water springing forth from a fountain. When the water release valve is opened, the water sprays out of the fountain jets. Observing this in slow motion, the water emerges from the jets streaming up and out. Gravity causes the individual water streams to turn around after reaching a certain height according to the water pressure. In a similar fashion the magnetic field from a PEMF or AC EMF device emerges from the current carrying coil inside the device and extends out a certain distance according to the amount of current generated by the voltage and the number of turns of coil through which the current moves. The individual lines of magnetic force known as flux, in a similar fashion to the jets of water, turn around in their outward path and go in the opposite direction. Instead of gravity, polarity causes the change in direction since magnetic fields always have a north and south pole which completes the magnetic circuit. Technically, once a magnetic field is created, its lines of force extend out into infinity. But practically speaking, its influence ends when it decreases in intensity to that of the surrounding magnetic field generated by the earth, which is about half of a gauss. Yet radio waves and microwaves can have much lower magnetic field strength and still be picked up by receivers designed to detect such waves, such as our radio tuners and cell phones. How does this happen? The answer is frequency. While the intensity of the magnetic is extremely low compared to the earth's magnetic field, the frequency of the magnetic wave actually "rides" on the earth's field creating tiny ripples that can be detected by sensitive instruments like radios and cell phones. This amazing phenomenon makes wireless communication over great distances possible. A magnetic field can start off very strong at its source and it will attenuate by the square of the distance according to the laws of physics. So, for example, if the magnetic field emanating from a coil is measured at 100 gauss one inch away, it will only measure 25 gauss two inches away. Doubling the distance results in one quarter of the magnetic strength. You can see how quickly a magnetic field deteriorates to very small levels at short distances. At a distance of only a foot, the magnetic field in this example would be less than a gauss! But once that magnetic field is turned on and off or periodically reverses direction then the ripple effect is created and anything sensitive enough to detect it will be influenced.

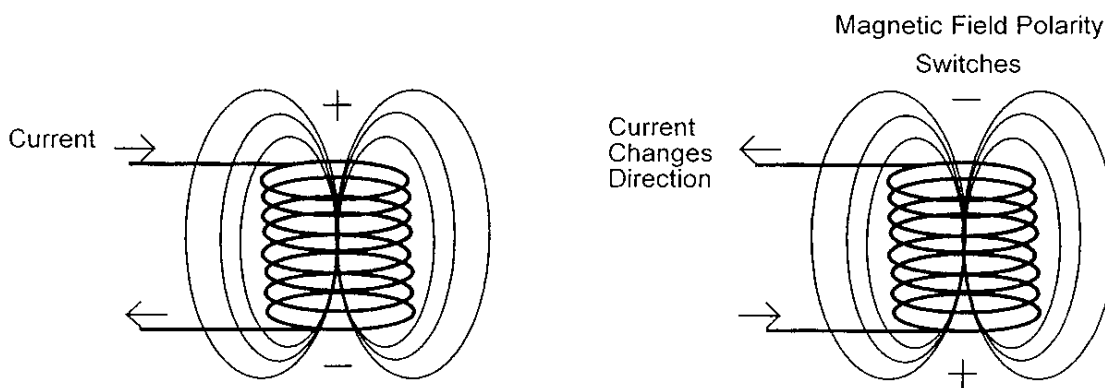
It may seem doubtful that very low-level magnetic ripples can have any influence on the human body, but documented research indicates otherwise. For instance, microwave resonance therapy, which is used primarily in Russia, employs low-intensity microwave radiation to treat a variety of conditions, including arthritis, ulcers, esophagitis, hypertension, chronic pain, cerebral palsy, neurological disorders, and side effects of chemotherapy (Devyatkov et al., 1991). Thousands of people in Russia also have been treated by specific frequencies of extremely low-level microwaves (less than 1/1000th of a gauss) applied at certain acupuncture points. The mechanism of action of microwave resonance therapy is thought to involve modifications in cell membrane transport or production of chemical mediators or both. Although a sizable body of Russian-language literature on this modality already exists, no independent validation studies have been conducted in the West. However, if such treatments prove to be effective, current views on how biological information is stored in molecular and cellular structures may need revision. It may be that such information is stored at the level of the whole organism in an exogenous field (existing outside the body). And that very low-intensity fields are sufficient to influence this exogenous field, which is inextricably linked to the living endogenous system.

If extremely low-level EMFs can have an influence on the human body, then it stands to reason that higher level EMFs may have an even greater influence. In fact, most EMFs used in therapy are at much higher levels than the ones used in microwave resonance. These devices generate their magnetic fields using electric current. However, it is also well known that permanent magnets produce magnetic fields without the use of current. Permanent magnets are used mainly in magnetic therapy as static field devices, meaning that they produce a field without a frequency. However, rotating permanent magnets can also create EMFs similar to PEMFs and AC EMF. Additionally, rotating permanent magnets produce an entirely unique type of EMF, which I term "Dynamic Direct Current Magnetic Fields" (DDCMF). Although no current is used to produce the magnetic field of a permanent magnet, permanent magnets produce direct current (DC) fields. The term DC is used because if direct current is passed through a coil of wire, a static magnetic field is produced which is the same as the static magnetic field produced in permanent magnets. The terms "static magnetic field" and "DC magnetic field" are often used interchangeably in magnet industry jargon.

The concept of DDCMFs is more than just a fancy name. It describes the action of a magnetic field that has characteristics not found in any other type of magnetic field. Not only is the behavior of a DDCMF different than a PEMF and AC EMF in certain respects, but also these differences have profound implications. In order to understand these implications we need to examine the properties of each type of field. First, let's look at exactly how a pulsed or AC magnetic field is generated. A very simple example would be to take a coil of wire and periodically cause a current to flow through it. If the current flows in one direction it would create a pulsed magnetic field emanating from the coil. If the current alternates back and forth it would create an AC magnetic field. These concepts are illustrated in the following drawings:



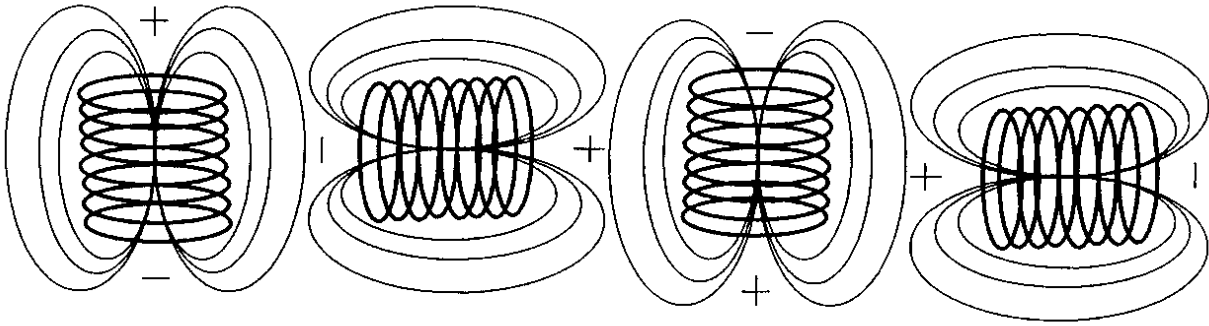
PEMF Illustration



AC EMF Illustration

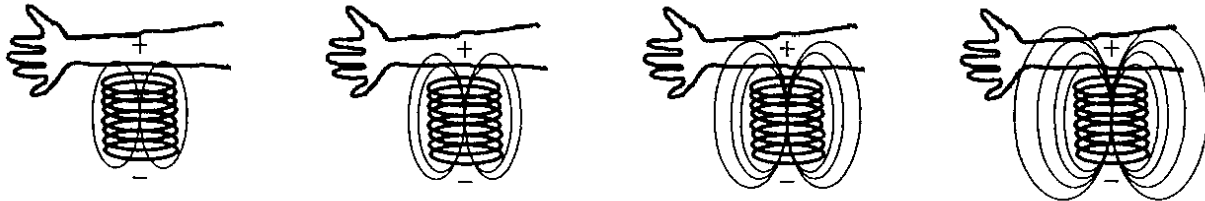
The plus and minus signs over the coils represent magnetic polarity, not electrical. The plus sign customarily signifies south polarity and the minus north polarity. However, it should be noted that an electric field is also present which pulses and alternates at the same frequency as the current, hence the term electromagnetic field (EMF). Also, the intensity of the magnetic and electric field is directly proportional to the amount of current passing through the coil. Hence, the magnetic field generated from a coil receiving 2 amps of current will be twice as strong as the magnetic field generated from the same coil receiving only 1 amp.

Let's see now how a dynamic DC magnetic field differs from the PEMF and AC EMF. The DDCMF starts off very much like the PEMF. Using the coil example, a direct current is passed through a coil of wire generating a magnetic field with a constant polarity. But here is where the similarities end. The current passing through the coil never turns off or reverses direction, but remains constant. Then, the entire coil is caused to rotate bringing the magnetic field surrounding it along for the ride. This is illustrated below:

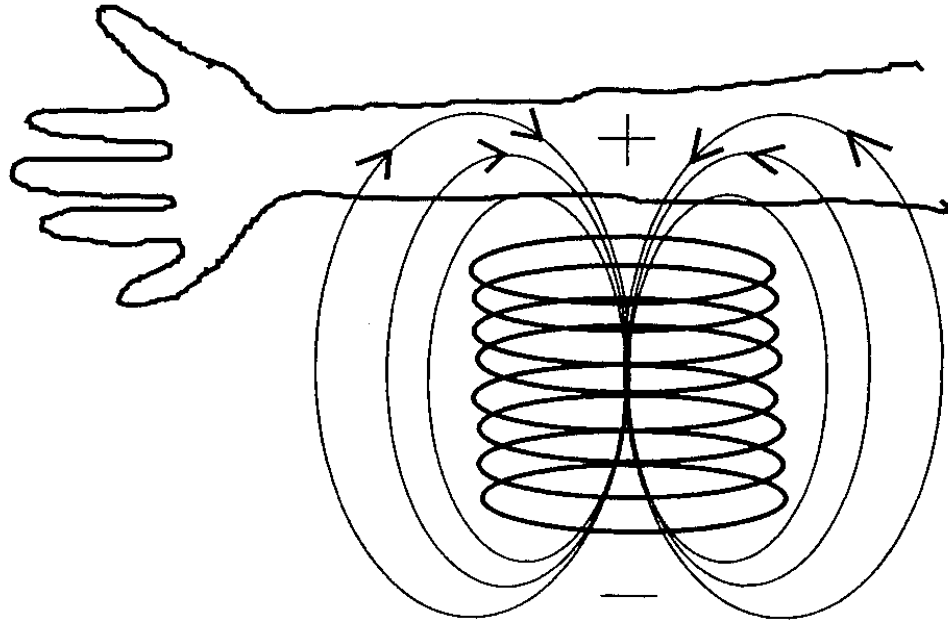


DDCMF illustration

The question now arises, "why is this significant"? Well, in terms of magnetic therapy this is very significant because the lines of magnetic force passing through biological tissue behave much differently among the different types of magnetic fields. Let's look first at how a PEMF would impinge upon a part of the human body; an arm, for instance:



The above illustration shows how the field grows and expands out from the coil into the arm. In a PEMF there is a periodic expansion and contraction of the field as the current is turned on and off through the coil. The magnetic lines of force (flux lines) follow one path through the tissue as the field expands and contracts. A close-up reveals this in greater detail:



The same is true for the AC EMF, except that the field changes polarity periodically which causes the magnetic lines of force to reverse direction through the tissue. In both the PEMF and AC EMF the flux lines follow the same path, and the intensity of the flux (the number of lines of magnetic force) increases as the field expands and decreases as the field contracts. Now, let's take a look at what happens with a DDCMF:



It is clear to see from the above illustration that the paths of the magnetic flux lines are continually changing. This is very significant because the targets of magnetic therapy are the nerves in the body. Neural orientation is a generally random situation. Applying a magnetic field to optimally effect a given nerve is a hit or miss proposition. By continually changing the path that magnetic lines of force follow, an increased probability of optimal magnetic/neural interaction occurs.

The PalmMag 1000 goes one step further and continually changes the flux path along two rotational axes, instead of one. This added dimension of spatial influence greatly enhances the probability that more nerves will be optimally affected by the magnetic field. Since bi-axial movement produces flux path changes in three dimensions it is more difficult to illustrate in a drawing. But the concept can be described with an analogy. Using water again as a substitute for the magnetic field, consider how you would best wash dirt off your driveway or any other object. If you operate your garden hose like a PEMF device you would periodically squeeze the handle to turn the water on and off. If you were fast enough you might squeeze it 5 times per second, or at a frequency of 5 Hz. But you cannot move

the hose around while you do this. It must point in one direction while you squeeze the valve handle on and off. To be sure, some of the dirt will be washed away. With an AC EMF the analogy would be like squeezing the handle on gradually until the water stream is fully open then gradually releasing the handle until it is fully shut off, repeating this very quickly over and over again at a certain frequency. Again you are not permitted to move the hose around while performing this operation. Once again, some of the dirt would surely be washed away. Now we come to the DDCMF analogy with bi-axial rotation. In this case you never turn the hose off. Instead you continually change the direction of the hose nozzle so that the water sprays out in different directions. And while you are doing this you simultaneously alter the angle at which the stream of water hits the ground. If you can imagine this all happening very quickly and continuously you would soon realize that the dirt would be cleared away much faster and more thoroughly. In fact, when people wash the soap off of their cars with a hose they instinctively wiggle the hose nozzle around and constantly change the angle of the spray to get the soap off more completely.

Such examples may seem elementary but they drive home the point that the way magnetic flux lines move can influence the effect they have on the body. Since the PalmMag is an entirely new device that is patent pending and it utilizes an innovative new type of EMF, studies to verify its enhanced efficacy need to be conducted. But preliminary anecdotal reports thus far have been astounding. Cases of chronic lower back pain, intractable knee and shoulder immobility, painful sciatic nerve inflammation, to name a few, have yielded to the PalmMag's incredible ability to bombard the tissue with magnetic flux at a multitude of different angles dramatically increasing the probability that the optimal angle of magnetic influence will be achieved for each given condition. No negative side effects have yet to be observed regardless of the duration of the treatments. In the interest of furthering the medical field's effective arsenal of noninvasive modalities, clinical trials using the PalmMag should commence without delay.

Magnetic Energy - How Safe Is It?

copyright © 2009 Nu-Magnetics, Inc.

Today, a growing concern is emerging which links cancer to electromagnetic fields, more commonly known as EMF. This concern is supported by increasing clinical evidence that certain EMF radiation has accelerated cancer growth in laboratory animals' and statistical studies showing an increased incidence of cancer among humans in areas exposed to higher than average amounts of EMF, especially the type coming from electric power lines.' Lately, the major TV news networks have been reporting daily about this alarming connection between EMF and cancer.

In light of the startling new evidence, many people understandably are asking, *How safe are the magnetic fields used in magnetic therapy?*

To answer that question, a distinction first needs to be made between magnetic fields and electromagnetic fields. As the name implies, electromagnetic fields contain a magnetic field and an electric field. One cannot exist without the other in EMF radiation. A purely magnetic field, on the other hand, is just that, purely magnetic. There is no electric field present at all. That's because the magnetic field, in this case, is not being produced by electricity as with EMF, but by the alignment of atoms that have their electrons all spinning in the same direction. A prime example of pure magnetism is a permanent magnet.

Further, EMFs are **traveling waves of energy**. All traveling waves of energy are created by fields that periodically change their polarity. (+--+--+ etc.). In other words, they all have a frequency. In contrast, pure magnetic fields are static, meaning they have **no frequency**.

These differences are important to consider because if EMF is harmful, then it is reasonable to ask, which component is harmful? Is it the electric field? Is it the magnetic field? Or is it a combination of both? Scientists, at present, don't really know.

If it's the electric field, for instance, then of course static magnets are safe since they have no electric field. If it is the magnetic field that is the culprit, then consider that the magnetic field from EMF is an alternating magnetic field operating at a continuous frequency. The constant bombardment of living organisms with this type of energy is strictly a man made phenomenon created

without regard for biological life. Although EMF play a vital part in the functioning of modern day society, their interaction with biological life is wholly unnatural.

In contrast, pure magnetism is a static or stationary field and is entirely natural. The earth itself is basically a very large static magnet. Since time immemorial life has existed in a static magnetic field, it is reasonable to assume that it may be harmful **not to have** such a field. In fact, there is considerable evidence to support this assumption.

Dr. Kyoichi Nakagawa, director of the Isuzu Hospital in Tokyo, Japan, wrote an article in the Japan Medical Journal in 1976 entitled, ***Magnetic Field Deficiency Syndrome and Magnetic Treatment***. In it he attributes a multitude of common ailments, from backaches to insomnia, to the fact that the earth's magnetic field has decreased over the centuries. That, coupled with modern day living conditions which decrease the field even further, contributes to a deficiency of necessary magnetism in the body. He cites several clinical studies which demonstrate how static magnets have been used successfully to treat these ailments where conventional treatments had failed. Dr. Nakagawa firmly believes that the therapeutic use of static magnetism is a necessary tool for healthy living in the modern world.

Dr. Nakagawa is not alone. As the doors of alternative medicine are finally opening in the west, more and more researchers are rediscovering the benefits of natural magnetism and are looking for new and innovative ways of incorporating this benign energy into people's lives. The new magnetic therapeutic pads are one recent and exciting example of this.

Hopefully, the future will reveal even greater breakthroughs in magnetic therapy. As society slowly emerges from years of conditioning that the only approach to good health is through drugs and surgery, let's keep an optimistic view that greater discoveries are just on the horizon.

Magnetic Energy - How Safe Is It?

copyright © 2009 Nu-Magnetics, Inc.

Today, a growing concern is emerging which links cancer to electromagnetic fields, more commonly known as EMF. This concern is supported by increasing clinical evidence that certain EMF radiation has accelerated cancer growth in laboratory animals' and statistical studies showing an increased incidence of cancer among humans in areas exposed to higher than average amounts of EMF, especially the type coming from electric power lines.' Lately, the major TV news networks have been reporting daily about this alarming connection between EMF and cancer.

In light of the startling new evidence, many people understandably are asking, *How safe are the magnetic fields used in magnetic therapy?*

To answer that question, a distinction first needs to be made between magnetic fields and electromagnetic fields. As the name implies, electromagnetic fields contain a magnetic field and an electric field. One cannot exist without the other in EMF radiation. A purely magnetic field, on the other hand, is just that, purely magnetic. There is no electric field present at all. That's because the magnetic field, in this case, is not being produced by electricity as with EMF, but by the alignment of atoms that have their electrons all spinning in the same direction. A prime example of pure magnetism is a permanent magnet.

Further, EMFs are **traveling waves of energy**. All traveling waves of energy are created by fields that periodically change their polarity. (+--+--+ etc.). In other words, they all have a frequency. In contrast, pure magnetic fields are static, meaning they have **no frequency**.

These differences are important to consider because if EMF is harmful, then it is reasonable to ask, which component is harmful? Is it the electric field? Is it the magnetic field? Or is it a combination of both? Scientists, at present, don't really know.

If it's the electric field, for instance, then of course static magnets are safe since they have no electric field. If it is the magnetic field that is the culprit, then consider that the magnetic field from EMF is an alternating magnetic field operating at a continuous frequency. The constant bombardment of living organisms with this type of energy is strictly a man made phenomenon created

without regard for biological life. Although EMF play a vital part in the functioning of modern day society, their interaction with biological life is wholly unnatural.

In contrast, pure magnetism is a static or stationary field and is entirely natural. The earth itself is basically a very large static magnet. Since time immemorial life has existed in a static magnetic field, it is reasonable to assume that it may be harmful **not to have** such a field. In fact, there is considerable evidence to support this assumption.

Dr. Kyoichi Nakagawa, director of the Isuzu Hospital in Tokyo, Japan, wrote an article in the Japan Medical Journal in 1976 entitled, ***Magnetic Field Deficiency Syndrome and Magnetic Treatment***. In it he attributes a multitude of common ailments, from backaches to insomnia, to the fact that the earth's magnetic field has decreased over the centuries. That, coupled with modern day living conditions which decrease the field even further, contributes to a deficiency of necessary magnetism in the body. He cites several clinical studies which demonstrate how static magnets have been used successfully to treat these ailments where conventional treatments had failed. Dr. Nakagawa firmly believes that the therapeutic use of static magnetism is a necessary tool for healthy living in the modern world.

Dr. Nakagawa is not alone. As the doors of alternative medicine are finally opening in the west, more and more researchers are rediscovering the benefits of natural magnetism and are looking for new and innovative ways of incorporating this benign energy into people's lives. The new magnetic therapeutic pads are one recent and exciting example of this.

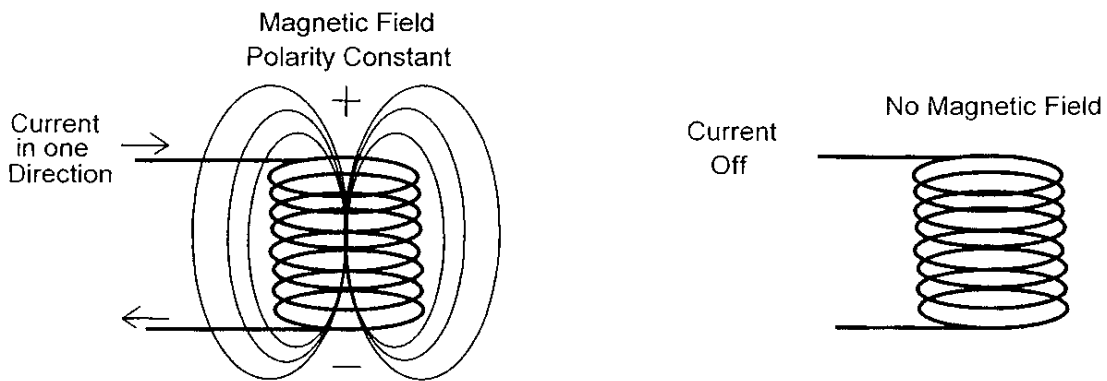
Hopefully, the future will reveal even greater breakthroughs in magnetic therapy. As society slowly emerges from years of conditioning that the only approach to good health is through drugs and surgery, let's keep an optimistic view that greater discoveries are just on the horizon.

Pulsed and AC Electromagnetic Fields Vs. Dynamic DC Magnetic Fields

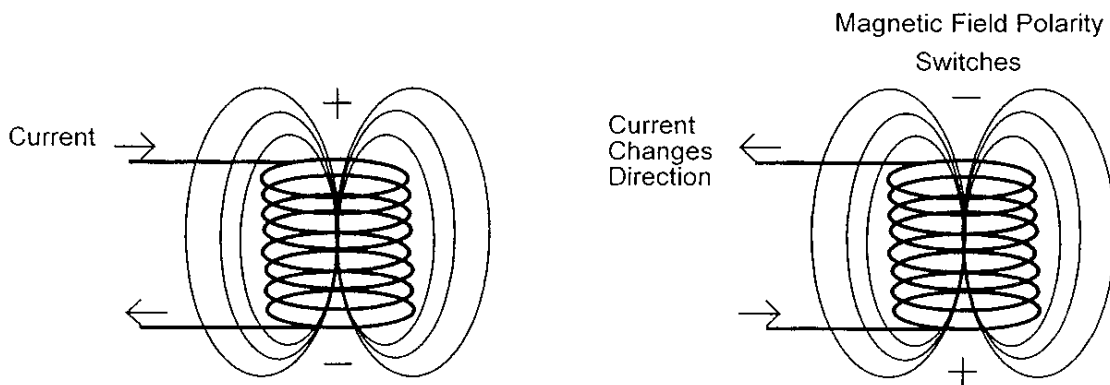
copyright © 2009 Nu-Magnetics, Inc.

This paper is intended to clarify the important differences between pulsed and AC electromagnetic fields (PEMF and EMF) and dynamic DC magnetic field (DDCMF), specifically as they relate to magnetic therapy. The purpose of this clarification is to differentiate the magnetic therapeutic device called the PalmMag 1000 from other types of time-varying magnetic field devices.

First, let's look at exactly how a pulsed or AC magnetic field is generated. A very simple example would be to take a coil of wire and periodically cause a current to flow through it. If the current flows in one direction it would create a pulsed magnetic field emanating from the coil. If the current alternates back and forth it would create an AC magnetic field. These concepts are illustrated below:



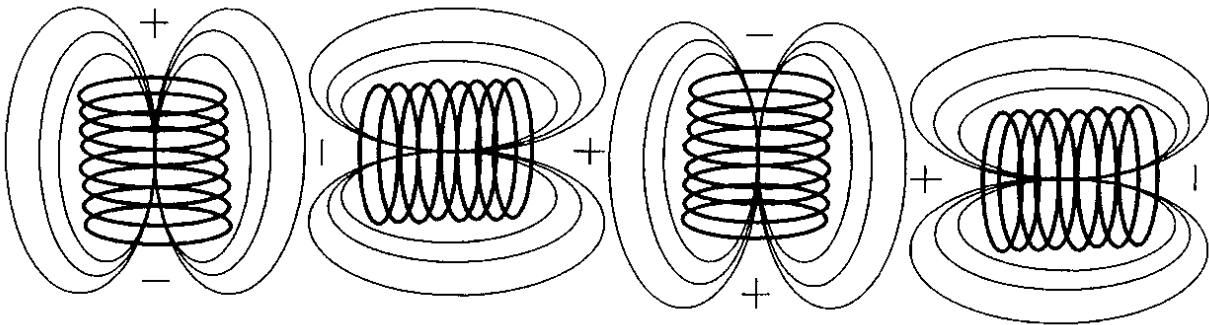
PEMF Illustration



AC EMF Illustration

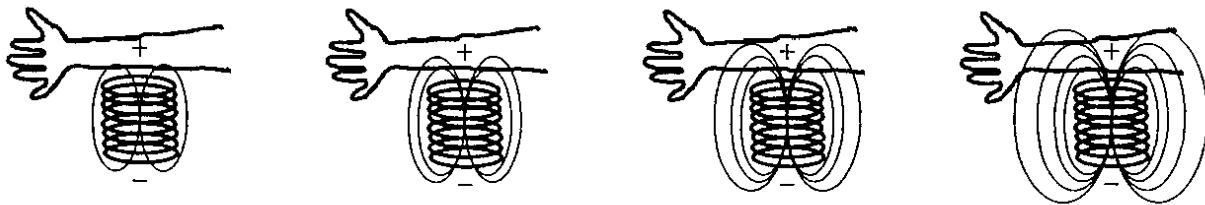
The plus and minus signs over the coils represent magnetic polarity, not electrical. The plus sign customarily signifies south polarity and the minus north polarity. However, it should be noted that an electric field is also present which pulses and alternates at the same frequency as the current, hence the term electromagnetic field (EMF). Also, the intensity of the magnetic and electric field is directly proportional to the amount of current passing through the coil. Hence, the magnetic field generated from a coil receiving 2 amps of current will be twice as strong as the magnetic field generated from the same coil receiving only 1 amp.

Let's see now how a dynamic DC magnetic field differs from the PEMF and AC EMF. The DDCMF starts off very much like the PEMF. Using the coil example, a direct current is passed through a coil of wire generating a magnetic field with a constant polarity. But here is where the similarities end. The current passing through the coil never turns off or reverses direction, but remains constant. Then, the entire coil is caused to rotate bringing the magnetic field surrounding it along for the ride. This is illustrated below:

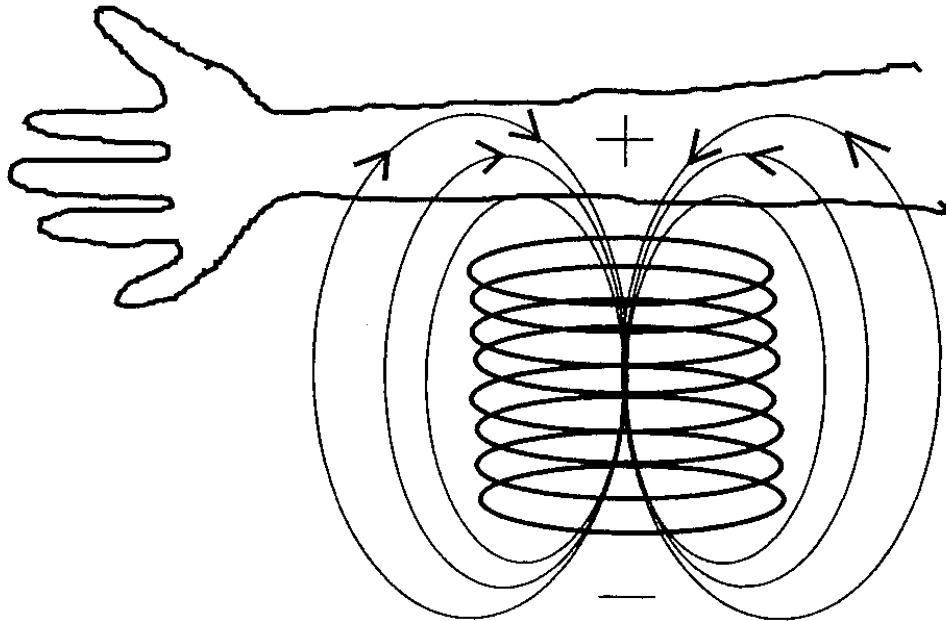


DDCMF illustration

The question now arises, "why is this significant"? Well, in terms of magnetic therapy this is very significant because the lines of magnetic force passing through biological tissue behave much differently among the different types of magnetic fields. Let's look first at how a PEMF would impinge upon a part of the human body; an arm, for instance:



The above illustration shows how the field grows and expands out from the coil into the arm. In a PEMF there is a periodic expansion and contraction of the field as the current is turned on and off through the coil. The magnetic lines of force (flux lines) follow one path through the tissue as the field expands and contracts. A close-up reveals this in greater detail:



The same is true for the AC EMF, except that the field changes polarity periodically which causes the magnetic lines of force to reverse direction through the tissue. In both the PEMF and AC EMF the flux lines follow the same path, and the intensity of the flux (the number of lines of magnetic force) increases as the field expands and decreases as the field contracts. Now, let's take a look at what happens with a DDCMF:

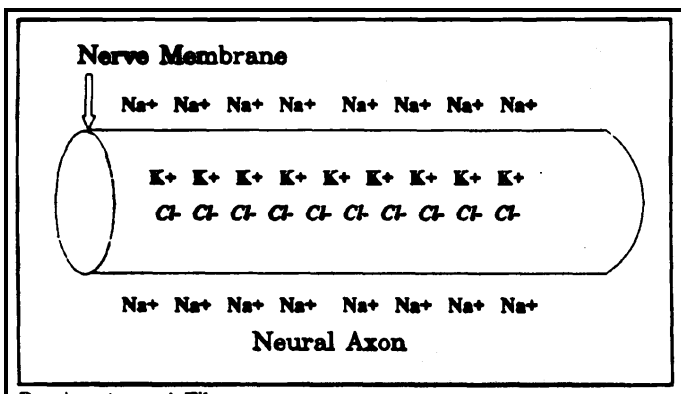


It is clear to see from the above illustration that the paths of the magnetic flux lines are continually changing. This is very significant because the targets of magnetic therapy are the nerves in the body. Neural orientation is a generally random situation. Applying a magnetic field to optimally effect a given nerve is a hit or miss proposition. By continually changing the path that magnetic lines of force follow, an increased probability of optimal magnetic/neural interaction occurs. The PalmMag 1000 goes one step further and continually changes the flux path along two rotational axes, instead of one. This added dimension of spatial influence greatly enhances the probability that more nerves will be optimally affected by the magnetic field.

Neurological Effects of the New Magnetic Therapeutic Pads

copyright © 2009 Nu-Magnetics, Inc.

Clinical studies have indicated a possible mechanism for the remarkable ability of the new magnetic therapeutic pads to relieve pain. As we are all aware, the transmission of physical pain is strictly a function of the nervous system. The human body contains an extensive network of nerves which collectively make up our five senses, allowing us to perceive the physical around us and alerting us to conditions which are harmful to our bodies through the perception of pain. So as unpleasant as it might feel, pain plays a very important role in our survival. However, millions of people suffer needlessly from pain that has no apparent cause. Such a condition is clinically known as **Chronic Pain Syndrome**. To understand why this happens we must first understand how pain is transmitted by the nerves.



Resting Axonal Fiber

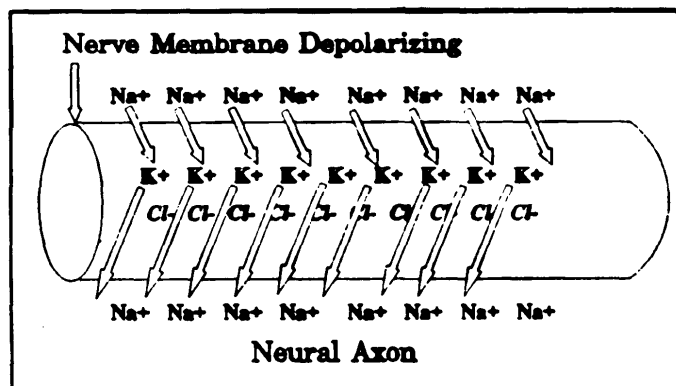
The nerve itself can be thought of as an electrochemical device that responds to external stimulation by producing minute electrical signals which initiate a series of chemical and electrical changes between the inside and outside of the nerve. These changes occur in a chain reaction which travels down the long nerve stem called the **axon connecting to other nerves until it finally reaches the brain.**

The figure above shows the axon in its normal, unstimulated state. Notice that sodium ions (Na⁺) are concentrated just outside the axon while potassium (K⁺) and chloride (Cl⁻) ions are on the inside.

The separation of these electrically charged particles by the nerve membrane produces a voltage of about 70mV (70 thousandths of a volt) between the outside and inside of the nerve. This voltage is called the **resting membrane potential**. As long as the resting potential is

present pain cannot be transmitted. But when a sufficiently strong stimulus is imposed on the nerve a change occurs as illustrated in the next figure. Suddenly the nerve membrane becomes more porous and the Na⁺ ions rush in while K⁺ ions move out.

This exchange of ion concentrations causes a change in the electrical voltage across the nerve. The resting potential suddenly drops from 70mV to 0mV. This is called **depolarization**. But the process doesn't stop here. The section of nerve just ahead of the depolarized area responds to this change and also becomes depolarized while mechanisms in the nerve cause the area that was just depolarized to return to its original state. This is



Depolarizing Axonal Fiber

called **repolarization**. This chain reaction can be described as a pain impulse that travels from its point of origin to the spinal cord and then to the brain where it is finally recorded as pain. As involved as this might sound, the whole process takes place in less than a split second!

A critical point to understand is that the pain impulse process is an all or nothing event. Once the resting potential drops to 55mV, the threshold potential, the whole chain of events is started and nothing can stop it!

Think for a moment what could happen if a nerve were sluggish and didn't maintain a healthy resting potential of 70mV. Let's say it produced only 60mV across its membrane. That means a drop of only 10mV would start the whole pain process. The slightest stimulus would cause pain and that dreaded condition of chronic pain

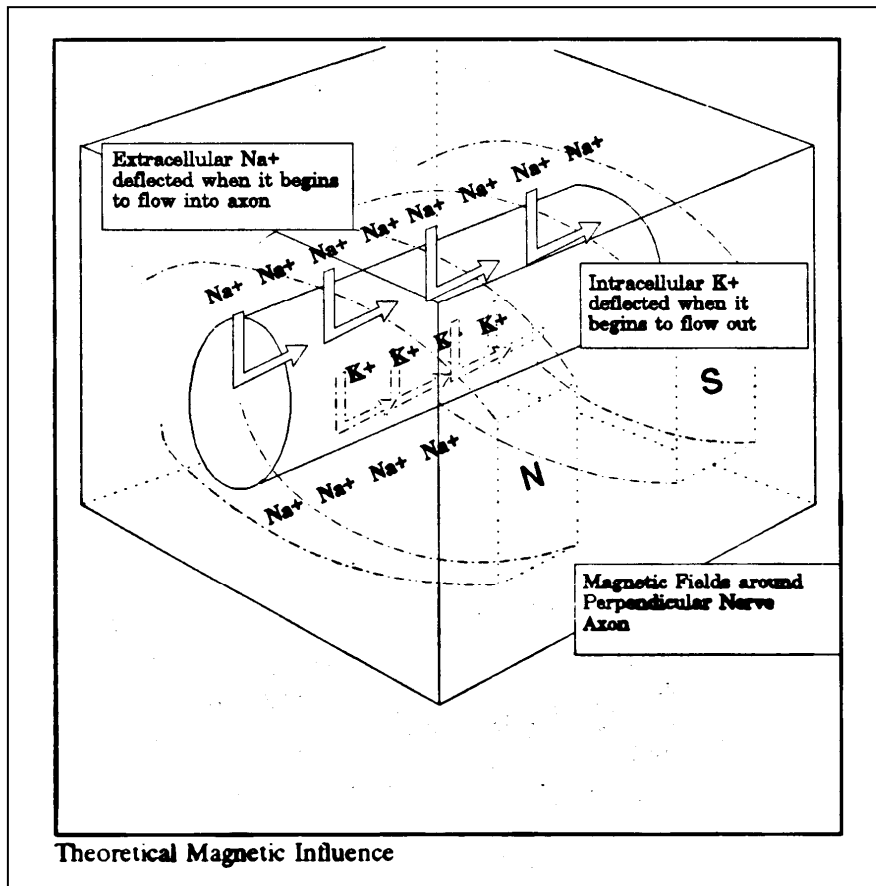
would now exist. Although this is only one possible explanation of a very complicated condition, it does bear a lot of weight and is supported by clinical observations on the effects of magnetic therapeutic pads. Dr. Peter Kokoschinegg of the Institute for Biophysics and Ray Research in Vienna firmly believes in the neurological effects of static alternating magnetic fields. In his report **The applications of Alternating Fields in Medicine** he states *...the magnetic field apparently reduces the neural depolarization of the slow C-fibers by shifting the membrane resting potential. The entire excitation of pain is thus influence and the subjective perception of pain changed.* Dr. Kokoschinegg successfully treated over 200 patient conditions using magnetic therapeutic pads.

In order to understand how the magnetic pad might influence the nerve consider that like the blood, nerves are also replete with ions. A properly positioned magnetic field would effect the movement of these ions and hence the electric field established between them.

In fact, anytime a magnetic field passes through ions in a direction perpendicular to their movement, the Hall Effect takes place and a Hall Voltage is produced. This voltage could add to the nerve's resting potential and raise it to a higher level making it less likely to depolarize. Also, the deflecting action of the magnetic field on the ions could make it more difficult for the ions to pass through the nerve membrane. This concept is illustrated below.

Either way, or perhaps a combination of both, tends to prevent nerve depolarization and hence stops the cycle of pain transmission.

Ultimately, though, however the magnetic pads work, they do work! And, like aspirin, various theories exist which try to explain their effectiveness. I believe that the theory presented in this paper is a very plausible one and I hope it lends some insight into a very complicated subject, pain.



1. **Facts on Electromagnetic Radiation.** George S. Lechter. Safe Technologies Corporation, Needham, MA 02194. 1991
2. **Facts on Electromagnetic Radiation.** et. al.

The Flexible Magnetic Pad

Principles of Operation

copyright © 2009 Nu-Magnetics, Inc.

The operation of the magnetic therapeutic pads is based upon laws of physics which are a part of a field of study commonly known as electromagnetism. The *Hall Effect*, first described in 1879, characterizes the behavior of charged particles moving through a magnetic field. This **Hall Effect forms** the foundation of the principle of operation of the therapeutic magnetic pads. The **Hall Effect** states:

... A voltage is generated perpendicular to a flow of charged particles moving through a magnetic field when that flow is directed perpendicular to the magnetic field.

This relationship can be expressed mathematically as:

$$E = Kn \ qB_1v$$

where

E = The Hall voltage

K = a proportionality constant (fudge factor)

n = the number of charged particles

q = the electric charge of each particles

B_1 = the magnetic flux density of the perpendicular magnetic field

v = the velocity of the moving charged particles

Since the magnetic pads are used therapeutically, the discussion will be limited to the Hall Effect as it applies to systems of the human body which serve as a source of moving charged particles in the blood and extracellular fluid, (lymphatics).

Blood is replete with ions which are present as a result of the dissociation of common salts found in the body. One such salt, NaCl, will be used here for illustrative purposes. Since blood is a fluid medium composed of water, NaCl contained in the into its ionic components Na^+ and Cl^- .

See Figure 1.

As illustrated in the diagram. (Figure 1) these ions will

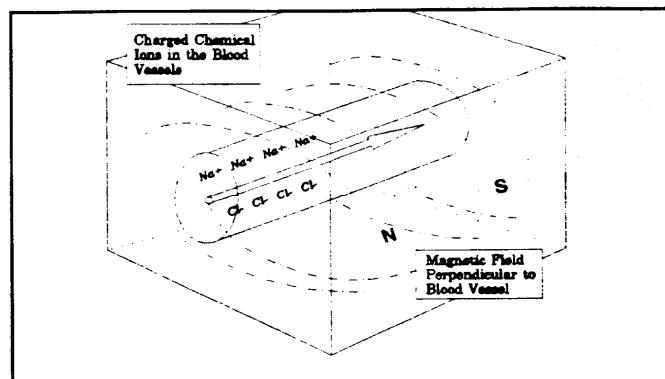


Figure 1

move with a certain velocity depending on the diameter of the blood vessel and the blood pressure.

As the ions pass through a magnetic field in a perpendicular direction to the field, they experience a voltage which drives them apart in opposite directions perpendicular to both the magnetic field and the direction of blood flow.

See Figure 2

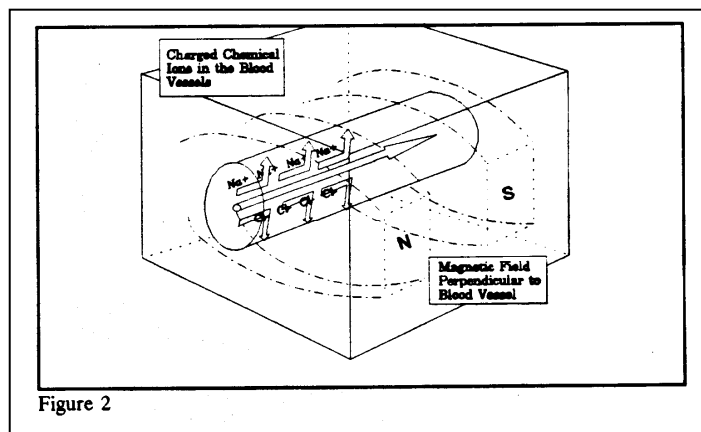


Figure 2

Since the ions are now moving under the influence of a voltage they become, in effect, an electric current whose magnitude is determined by the universal formula of electricity, Ohm's Law:

$$\text{electric current} = \text{Voltage} / \text{Resistance}$$

The ions soon encounter an infinite resistance, the walls of the blood vessel, thus causing the current to suddenly drop to zero. To overcome this limitation, the therapeutic magnetic pads utilizes alternating magnetic

poles which cause the ions in the blood to move in alternating directions, thus avoiding current interruption by the blood vessel walls. Figure 3.

The therapeutic value of the magnetic pads lies in the fact that the by product of current and resistance is heat. This heat is qualitatively represented by a well known formula of electricity:

$$\text{heat dissipated} = (\text{electric current})^2 \times \text{Resistance}$$

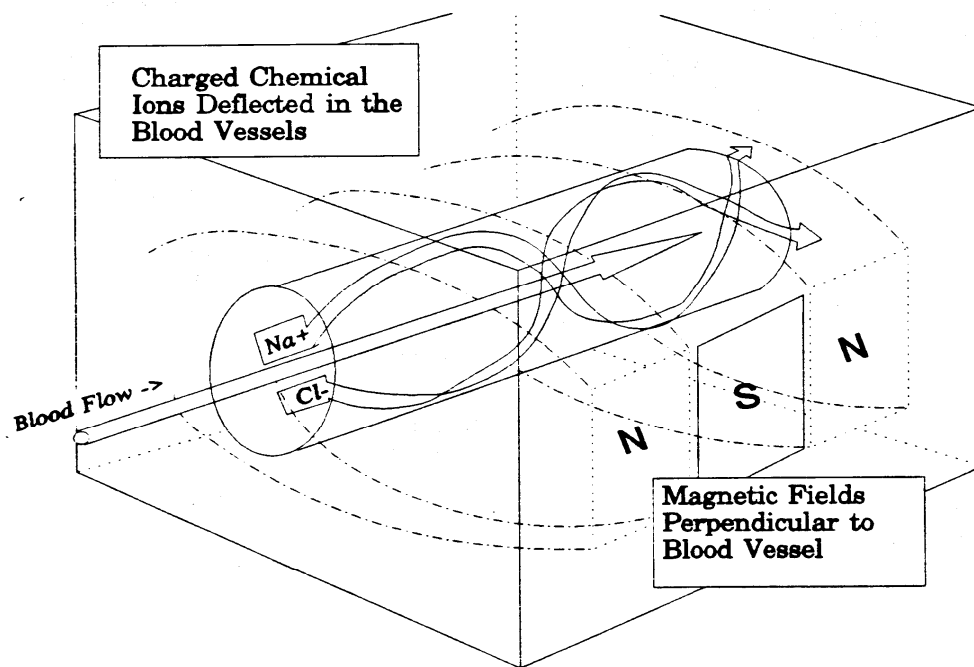
In most electric circuitry this heat is unwanted because it detracts from the electrical efficiency of the circuit.

However, for the purposes presented here this heat has a very important use. Heat, applied to afflicted areas of the body, such as sore muscles, tends to relieve pain and promote healing. Medical science explains that this effect occurs because the heat

compels a widening of the blood vessels, vasodilation, which in turn causes an increase in blood flow. This increase flow allows more oxygen and nutrients to reach the area and a greater flushing out of metabolic wastes.

Previous modalities of heat treatment, such as heating pads, are limited in their effectiveness because they provide heat from the outside in. Externally applied heat loses most of the heat to the outer layers of skin and tissue before reaching the desired area. The magnetic pads generate heat from the inside of the blood vessel itself, producing the desired effect where it is needed most. *

Since the device uses permanent magnets it can be used indefinitely without need of a recharge. Being light weight and compact, the device assures adequate comfort to the user. All these facts indicate that the magnetic therapeutic pads are a very effective and practical device.



Typesetting, layout and graphics by Dr. Matthew Newman, M.D./ Tacoma, WA 98403

**Although the heat generated by magnetic stimulation is relatively small, thermographic testing has shown a definite increase in temperature in the areas affected by these magnetic pads. Whether this temperature rise is a direct or indirect result of the magnetic field's influence on the ionic flow in the blood remains an open question.*

The New Nikken Sleep Mask: It's a Beautiful Thing!

copyright © 2009 Nu-Magnetics, Inc.

Did you know that a study was done in England in 1990 which showed that a magnetic field increased the production of fibroblasts in rat cells *? So what? *Well*, believe it or not, that study led to the creation of the new Nikken Sleep Mask. You see, fibroblasts are cells found in mammals that are the building blocks of collagen. Did you know that collagen is what mends broken bones and keeps our skin tight and wrinkle free? If people could increase the production of collagen in their skin which naturally decreases as we age then they could conceivably prevent wrinkles from forming and even erase the wrinkles that have already formed. We know that many people, especially movie stars who could afford it, routinely get collagen injections around their eyes and lips to decrease the wrinkles that usually form there. Unfortunately, since the extra collagen was not created by the body itself, overtime it is absorbed into the blood stream and eliminated. So in order to maintain the anti-wrinkling effect, collagen must be injected on a routine basis. How much better (and cheaper) would it be to produce the extra collagen naturally by one's own body? Well, the new Nikken Sleep Mask offers that possibility thanks to the landmark research work of Fraser McDonald in the study he conducted which was mentioned at the beginning of this article. McDonald saw the results of his study as having great implications for improved bone and wound healing. But the new Nikken Sleep Mask offers an additional benefit in the area of cosmetics. Women, and even some men, have searched high and low for years for some topical magic ointment that could help remove wrinkles. Retin-A and the latest Alpha Hydroxy creams have showed some promise but the search continues for even more effective methods. Chemical skin peels are in vogue, but they can be expensive and sometimes painful. Even vitamin C patches are being tried with some notable results. The new Nikken Sleep Mask can be used alone or in conjunction with the other modalities available to create a fortified defense in the battle against wrinkles. By stimulating the body's own production of collagen, the new Sleep Mask offers a unique approach to the problem. Being totally non-invasive and very comfortable to wear, the mask is placed directly on the face during sleep at night or *while* comfortably lying down during the day. The effects of the magnetic field are more subtle and gradual, but continued use over a period of months should produce noticeable results which are lasting. And remember these results are not just a cover-up of wrinkles but the actual removal because the underlying cause which is a lack collagen has been addressed. Of course, using the Sleep Mask in conjunction with the previously mentioned face creams, patches or skin peels could speed up the process if so desired.

Yes, the new Nikken Sleep Mask is truly in a class by itself And with the hope of helping women maintain their youthful beauty throughout the years, is *it* any wonder why we say, "***It's a beautiful thing!***" .