Microcurrent Electrical Therapy Mechanisms and Results

In part one of this series, the efficacy of MET to control pain is reviewed.

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Agrowing body of research shows the effectiveness of microcurrent electrical therapy (MET) to control pain.

Robert O. Becker, MD, of the Department of Orthopedic Surgery, State University of New York Upstate Medical Center, demonstrated that low level endogenous electrical currents are the triggers that stimulate healing, growth and regeneration in all living organisms, and suggested that this system becomes less efficient as we age.[1]

Dr. Becker postulated that the first living organisms must have been capable of self-repair, otherwise they never would have survived. The repair process requires a closed-loop system. A specific signal is generated, called the current of injury, which causes another signal to start repair. The injury signal gradually decreases over time with the repair process, until it finally stops when the repair is complete. Such a primitive system does not require demonstrable consciousness or intelligence. In fact, many animals have a greater capacity for healing than humans.

Science has amassed a vast amount of information on how the brain and nervous system work. Most of this research involves the action potential as the sole mechanism of the nerve impulse. This is a very sophisticated and complex system for the transfer of information. It is helpful to compare this conceptualized concept of the nervous system to a computer.

The fundamental signal in both the computer and the nervous system is a digital one. Both systems transfer information represented by the number of pulses per unit of time. Information is also coded according to where the pulses originate, where they go and whether or not there is more than one channel of pulses feeding into an area. All our senses are based on this type of pulse system. Like a computer, the nervous system operates remarkably fast and can transfer large amounts of information as digital on and off data.

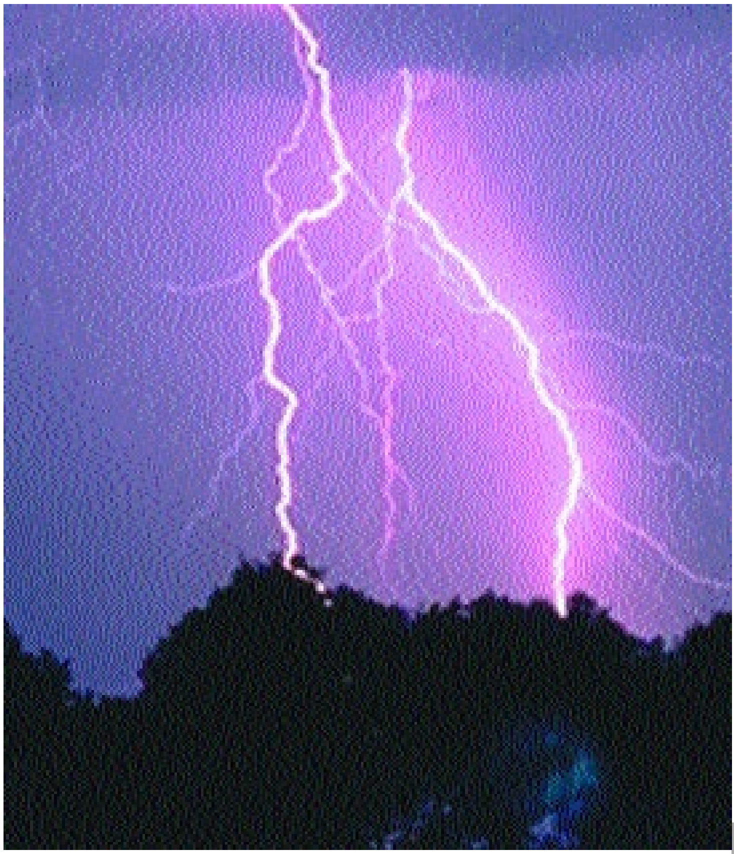
It is unlikely that the first living organisms had such a sophisticated system. Dr. Becker believes they must have had a much simpler mechanism for communicating information because they did not need to transmit large amounts of sophisticated data. Accordingly, they probably used an analog system, which works by means of simple DC currents. Information in an analog system is represented by the strength of the current, its direction of flow and slow wavelength variations in its strength. This is a much slower system than the digital model. However, the analog system is extremely precise and works well for its intended purpose.

Dr. Becker theorizes that primitive organisms used this analog type of data-transmission and control system for repair. He postulates that we still have this primitive nervous system in the perineural cells of the central nervous system. The perineural cells, which comprise 90 percent of the nervous system, have semiconductor properties that allow them to produce and transmit non-propagating DC signals. This system functions so vastly different from the "all or none" law of propagation of the nerve action potentials that Dr. Becker called this the fourth nervous system.

This analog system senses injury and controls repair. It controls the activity of cells by producing specific DC electrical environments in their vicinity. It also appears to be the primary primitive system in the brain, controlling the actions of the neurons in their generation and receipt of nerve impulses.

Accordingly, as knowledge of this aspect of our nervous system is uncovered, another mystery of brain physiology may be explained, including the regulation of our consciousness and decision-making processes. Given this understanding, the application of the correct form of microcurrent electrical intervention is a powerful tool for treating pain, initiating the endogenous mechanisms for healing and altering states of consciousness.

Ngok Chang, MD, of the Department of Biochemistry and Orthopedic Surgery at the University of Louvain, Belgium proposed another mechanism for MET.[2] His research showed that microcurrent stimulation increased adenosine triphosphate (ATP) generation by almost 500 percent. Increasing the level of current to milliampere levels actually decreased the results. Microcurrent was also shown to enhance amino acid transport and protein synthesis in the treated area 30 to 40 percent above controls.



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[2]**Table 1.** *Results of using Alpha-Stim™ technology for MET and CES as reported by health care practitioners. Total N = 500 patients with multiple symptoms.*

It would be helpful to review the cellular nature of an injury to fully appreciate the importance of Dr. Chang's research. Dr. Becker has shown that trauma will affect the electrical potential of cells in damaged tissues. Initially the injured site has a much higher resistance than that of the surrounding tissue. Basic physics dictates that electricity tends to flow toward the path of least resistance. Therefore endogenous bioelectricity avoids areas of high resistance and takes the easiest path, generally around the injury. The decreased electrical flow through the injured area decreases the cellular capacitance.[3] As a result, healing is actually impaired. This may be one of the reasons for inflammatory reactions, such as pain, heat, swelling and redness. Electricity flows more readily through these hot inflammatory fluids.

The correct microcurrent application to an injured site augments the endogenous current flow and allows the traumatized area to regain its capacitance. The resistance of the injured tissue is then reduced allowing bioelectricity to enter the area to reestablish homeostasis. Therefore microcurrent electrical therapy can be viewed as a catalyst helpful in initiating and sustaining the numerous chemical and electrical reactions that occur in the healing process.

ATP is an essential factor in the healing process. Large amounts of ATP, the cell's main energy source, are required to control primary functions such as the movement of vital minerals, like sodium, potassium, magnesium and calcium, into and out of the cell. It also sustains the movement of waste products out of the cell. Injured tissues are deficient in ATP.

As MET restores circulation and replenishes ATP, nutrients can again flow into injured cells and waste products can flow out. This is necessary for the development of healthy tissues. As ATP provides the energy tissues require for building new proteins, it also increases protein synthesis and membrane transport of ions.

Björn Nordenström, MD, professor of Diagnostic Radiology at the Karolinska Institute, Stockholm, Sweden, and former chairman of the Nobel Assembly, has also proposed a model of bioelectrical control systems he calls biologically closed electric circuits (BCEC).[4,5] The principle is analogous to closed circuits in electronic technology. Dr. Nordenström's theory is that the mechanical blood circulation system is closely integrated anatomically and physiologically with a bioelectrical system.

Dr. Nordenström hypothesizes that ionic and nonionic compounds interact in a way that makes selective distribution and modulation of electrical and other forms of energy possible throughout the body, even over long distances. The biological circuits are switched on by both normal electrical activities of the organs and pathological changes, such as tumor, injury or infection. Like Dr. Becker, Dr. Nordenström views bioelectricity as the primary catalyst of the healing process.

Using the vascular interstitial system as an example, Dr. Nordenström postulates two branches of this system. The first branch, the intravascular system, proposes that walls of blood vessels act as insulators, much like cables in a battery system. The electrical resistance of the walls of the arteries and veins is 200 to 300 times greater than the blood within.

Delayed available energy, or potential energy, is carried by blood cells which bind oxygen, as well as other chemicals such as glucose, neutral fat, nonpolar amino acids, etc. These are all noncharged packages of energy that arrive at specific sites and are released primarily by reduction/oxidation. Dr. Nordenström terms these ergonars. The intravascular plasma acts as the conductor, where ions such as sodium, calcium and chloride supply immediately available energy to the system, primarily by electrophoresis. Dr. Nordenström calls these ionars.

The second branch addresses the interstitial system. The tissue matrix acts as an insulator while the interstitial fluid acts as a conductor.

Condition	N	Worse	No Change	Slight	Fair 25-49%	Moderate 50-74%	Marked 75-99%	Complete 100%	Significant >25%
Pain	286	1 0.35%	5 1.75%	20 6.99%	48 16.78%	77 6.92%	108 37.76%	27 9.44%	260 90.91%
Anxiety	349	0 0.00%	8 2.29%	114 4.01%	39 11.17%	89 25.50%	181 51.86%	18 5.16%	327 93.70%
Depression	184	0 0.00%	8 4.35%	11 5.98%	31 16.85%	38 20.65%	82 44.57%	14 7.61%	165 89.67%
Stress	259	0 0.00%	6 2.32%	12 4.63%	37 14.29%	70 27.03%	124 47.88%	10 3.86%	241 93.05%
Insomnia	135	0 0.00%	16 11.85%	12 8.89%	17 12.59%	34 25.19%	45 33.33%	11 8.15%	107 79.26%
Headache	151	1 0.66%	8 5.30%	6 3.97%	25 16.56%	32 21.19%	63 41.72%	16 10.60%	136 90.07%

Muscle Tension	259	2 0.77%	6 2.32%	6 2.32%	42 16.22%	76 29.34%	111 42.86%	16 6.18%	245 94.59%

Capillary membranes are the main components that close the system. These membranes act as junctions between the interstitial and vascular fluids allowing exchange of ionars and ergonars along gradients of electrical potential.

This theory represents a comprehensive attempt to describe functions of anatomical components in terms of electromagnetic forces, rather than limiting them to chemical interactions. Nordenström further theorizes that similar closed circuit systems exist in urinary and gastrointestinal systems. Using electrical intervention, Dr. Nordenström reversed terminal cancer in most of his patients as clinical proof of his theories.[6,7] Several other researchers are confirming the value of electromedicine for the treatment of cancer.[8-12]

The medical community has barely taken notice of these remarkable theories. Few practitioners are even aware of the works of Drs. Becker or Nordenström. Dr. Nordenström is experienced with this type of ignorance. In the 1950's he pioneered a series of remarkable innovations in clinical radiology (including percutaneous needle biopsy) that were considered radical at the time, but are routinely employed by every major hospital in the world today.

Lack of updated education in health care professionals is the main stumbling block to acceptance of the modern theories and practice of electromedicine. The other problem is the wide variety of technologies available. At present, there are more than 100 different models of transcutaneous electrical nerve stimulation (TENS) devices in the marketplace and an increasing number of other electrical devices. Most health care practitioners who want to utilize such technology have received little or no training in electrobiology or electrical technology. Hence, when it comes to making an educated decision on what type of instrument to choose for a practice or a particular patient, practitioners are often overwhelmed when meeting an electromedical sales representative. Purchase decisions are frequently made based on lack of knowledge, misinformation, unsubstantiated claims such as testimonials not backed by solid research, or price. Not all technology is equally efficacious. In fact, there is a wide variance of results with microcurrent devices. Health care professionals should rely only on evidence-based technologies supported by double-blind research.

Survey Results

Practitioner and patient surveys are useful tools for providing a quick reference to the results achieved with a therapeutic intervention. Two surveys were recently conducted on a total of 3,000 people using technologies employing the combined protocols of MET and cranial electrotherapy stimulation (CES). Practical step-by-step treatment protocols to achieve these results will be the subject of the next two articles in this series.

Condition	N	Slight <24%	Fair 25-49%	Moderate 50-74%	Marked 75-100%	Significant >25%
Pain (all cases)	1949	136 6.98%	623 31.97%	741 38.02%	449 23.04%	1813 93.02%
Back Pain	403	20 4.96%	109 27.05%	157 38.96%	117 29.03%	383 95.04%
Cervical Pain	265	18 6.79%	69 26.04%	125 47.17%	53 20.00%	247 93.21%
Hip/Leg/Foot Pain	160	6 3.75%	43 26.88%	53 33.13%	58 36.25%	154 96.25%
Shoulder/Arm/Hand Pain	150	13 8.67%	41 27.33%	63 42.00%	33 22.00%	137 91.33%
Carpal Tunnel	25	0 0.00%	5 20.00%	17 68.00%	3 12.00%	25 100.00%
Arthritis	188	11 5.85%	51 27.13%	88 46.81%	38 20.21%	177 94.15%

TMJ Pain	158	17 10.76%	60 37.97%	60 37.97%	21 13.29%	141 89.24%
Myofascial Pain	62	6 9.68%	18 29.03%	18 29.03%	20 32.26%	56 90.32%
RSD	55	10 18.18%	16 29.09%	19 34.55%	10 18.18%	45 81.82%
Fibromyalgia (alone)	142	13 9.15%	53 37.32%	52 36.62%	24 16.90%	129 90.85%
Fibromyalgia (with other)	363	33 9.09%	131 36.09%	152 41.87%	47 12.95%	330 90.91%
Migraine	118	2 1.69%	49 41.53%	30 25.42%	37 31.36%	116 98.31%
Headaches (all other)	112	20 17.86%	30 26.79%	24 21.43%	38 33.93%	92 82.14%
Psychological (all cases)	723	61 8.44%	175 24.20%	237 32.78%	250 34.58%	662 91.56%
Anxiety (alone)	128	13 10.16%	29 22.66%	42 32.81%	44 34.38%	115 89.84%
Anxiety (with other)	370	33 8.92%	85 22.97%	122 32.97%	130 35.14%	337 91.08%
Anxiety/Depression	58	3 5.17%	19 32.76%	19 32.76%	17 29.31%	55 94.83%
Depression (alone)	53	7 13.21%	11 20.75%	23 43.40%	12 22.64%	46 86.79%
Depression (with other)	265	29 10.94%	61 23.02%	93 35.09%	82 30.94%	236 89.06%
Stress	123	6 4.88%	30 24.39%	39 31.71%	48 39.02% 1	17 95.12%
Chronic Fatigue	50	3 6.00%	30 60.00%	10 20.00%	7 14.00%	47 94.00%
Insomnia	163	10 6.13%	47 28.83%	47 28.83%	59 36.20%	153 93.87%

Licensed health care practitioners completed a postmarketing survey of 500 patients in 1998.[13] There were 174 males and 326 females, ranging from five to 92 years old. Twenty-one patients were hospitalized at the time of treatment. Treatment was satisfactorily completed by 197 (41 percent) of the patients with 207 (43 percent) still receiving treatment at the time of the survey.

Ten patients discontinued treatment because they thought it was not helping them, and three more discontinued due to undesirable side effects. An additional 13 terminated treatment when their insurance ran out and they could no longer pay for treatment. Twenty patients moved out of the area while treatment was in progress or discontinued treatment for other, unstated reasons.

Negative adverse effects were all rare, mild and self-limiting, with 472 (94.4 percent) reporting none. Six (1.2 percent) reported vertigo as a side effect and two (0.4 percent) reported nausea, either of which normally occur when the current is set too high or in patients with a history of vertigo. Only three (0.6 percent) reported skin irritation, and one (0.2 percent) each reported, anger, a metallic taste, a heavy feeling or intensified tinnitus. These generally receded or disappeared as soon as the current was reduced.

The most important aspect of this survey was the results reported as a degree of improvement in the seven symptoms present in most patients for which MET and/or CES is prescribed; i.e., pain, anxiety, depression, stress, insomnia, headache and muscle tension. The treatment outcome was broken down into response categories beginning with [it made the condition] "Worse," and progressing up to "Complete" improvement or cure. As in pharmaceutical studies, a degree of improvement of 25 percent or more was considered to be clinically significant. The data for all 500 patients reporting on multiple symptoms is summarized in Table 1.

In addition, 2,500 patients were surveyed through a form attached to warranty cards.[14] The majority of the patients were female; 1,411 (72.40 percent). Ages ranged from 15 to 92 years old with a mean of 50.07 years. The length of use ranged from the minimum of three weeks that was the only inclusion criteria, to a maximum of five years in two cases. The average period of use reported was 14.68 weeks or approximately three and one-half months. Of 1,949 primary pain patients, 1,813, or 93.02 percent rated their improvement as significant, and these findings correlate well with the physicians' survey of 500 patients where 90.91 percent of 286 pain patients were observed to have significant improvement. The data for all 2,500 patients reporting on multiple symptoms is summarized in Table 2.

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