

# PANTHEON RESEARCH

INNOVATIVE BIOMEDICAL INSTRUMENTS

## Operation Instructions

### Electro-Stimulator 12c.Pro

The Pantheon Research Electro-Stimulator is a carefully engineered electro-acupuncture stimulator, designed specifically for the clinical requirements of the doctor performing percutaneous electrical stimulation with needles. This equipment is the finest available. It is highly reliable in function, very long lasting, effective in treatment, comfortable to the patient, and versatile in performance.

This is the sixth generation design of the Electrostimulator, and the reliability of it is very high. As a result, we offer a two year warranty. If you have any problem with the equipment within two years, we will fix it or provide a replacement.

For 20 years, the Electrostimulator family of equipment has been used extensively to treat patients for many syndromes including pain, addictions, and it has been used for analgesia during surgery. Dentists have used it widely for dental acupuncture, and for TENS stimulation. Veterinarians also are using the 6c.Pro and 8c.Pro for their work with animals. The Pantheon Stimulator is a very popular electro-therapeutic device that was designed to be more effective with its multiple unique features and special waveforms.

Pantheon Research electro-stimulators are more comfortable than other stimulators, due to its specially designed electro-acupuncture electrical waveform. This waveform is very fast, .4 milliseconds, and is equal in the positive and negative components. It does not efficiently stimulate the nerve cells that sense pressure or heat, and thus feels very comfortable, even at high stimulation levels. Patients appreciate this. It is also considered that the bipolar and symmetrical waveform is more physiologically compatible, as the tissues and nerves will be equally polarized and re-polarized with each electrical impulse.

The 12c.Pro electro-Stimulator has at least ten features that are **unique** to it alone. These include:

1. Unprecedented frequency accuracy of 99.94%.
2. Special electro-acupuncture waveform for milliampere current stimulation
3. Special electro-acupuncture waveform for microampere current stimulation
4. Two year warranty
5. Adjustable and calibrated mixed frequency
6. Built in alligator clip lead tester
7. Safety output controls : the machine cannot be turned ON if the output switches are not turned OFF
8. Output tester
9. Automatic battery tester
10. Pantheon MicroClips, the smallest alligator clips in the world

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## Features Explanations

### (A) **MODE** Knob

The Mode knob is located on the left side of the machine face, and is labeled as **MODE**. The available means of operation or modes are **CONT**, **DISC**, **MIXED**. These stand for continuous, discontinuous, mixed (also called intermittent or dense disperse). These will each be explained subsequently.

#### **CONT:** Continuous frequency

This selection setting provides a continuous output of electrical pulses, an unbroken series that continues until the machine is turned off. The basic frequency, or pulse rate, is determined by the Continuous (C) knob.

When the **CONT.** position is selected, the stimulator is turned **ON**, and the machine is operational. Electrical impulses will be available at the output jacks (L) & (K) (see pg. 6), on the top front of the machine, and the treatment can commence if the clips are attached to the patient and plugged into the output jacks. It is important that prior to connecting a patient to a clip lead, that the machine be turned to **CONT.**, and the stimulation Level control knobs (E) be turned all the way to the left, pointing to "0" (you will feel a click at "0")

#### **DISC:** Discontinuous frequency.

The output varies between the selected frequency, and no output, and the change occurs every three seconds. This is providing periodic and regular interruptions to the regular stimulation.

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## **MIXED:** Mixed Frequency

The electrical impulses will vary intermittently. Each three seconds, the frequency of the pulses will change from the setting indicated on the Continuous knob (C), to the setting indicated on the MIXED knob (D). Thus, the MIXED setting allows two variable frequencies to be provided, both of which are selectable.

## **BATT. Test** - Manual Battery test

This position will manually test the battery strength. If the battery is good, that is, if it has a voltage above 6 volts, the diagnostic light (labeled as Diag. (G)) will light green after 4 seconds. If the battery is not good, the diagnostic light (G) will be red. This will be a solid green, or a solid red.

## **(B) MINUTE TIMER**

### **10, 20, 30, 40 minutes**

The machine is turned ON by turning the MODE Knob (A) to either Cont, Disc, Mixed. The timer automatically begins a 10min countdown. At this point you can change the minute timer (B) to 20min, 30min, 40min, or leave it at the default of 10min. The machine will then operate for that time duration, and then shut OFF. When it shuts off, an audible beep sound will be heard. The beeper will shut off when you turn the MODE knob (A) to the OFF position.

## **SAFETY FEATURE**

The safety feature prevents accidental shocking of a patient. It works as follows: If all the level control knobs (E) are not turned to “0”, the machine cannot be turned ON.

If any level control knob is above “0” and the machine is turned on by turning the MODE knob (A) to Cont, Disc, Mixed, Batt. Test, you will hear a beeper sound and the diagnostic light (G) will be red. The machine will not function.

**EACH level control knob (E) must be turned to “0” (you can feel a click at “0”), then you can change the MODE knob (A) and the machine will operate normally.**

## **(C) Continuous – Frequency HZ**

This knob controls the basic frequency or pulse rate of the electrical pulses that are produced by the electro-stimulator. Frequency, or hertz, is the number of times per second that the electrical impulse travels from the machine to the patient.

The electro-stimulator has an extended frequency range. This is click stop selectable to specific therapeutic frequencies including .5, 1, 2, 4, 5, 10, 15, 25, 30, 100, and 200 cycles per second.

These frequencies are produced during the selection of the CONT. position of the MODE knob (A), and during the ON period of the DISC. selection, and during one of the frequency periods of the MIXED (D) selection.

## **(D) MIXED – Mixed Frequency**

This is the same in function to the Continuous (C) frequency knob, but controls the frequencies when the MODE knob (A) is turned to MIXED. These are the adjustable, calibrated mixed frequencies. These frequencies are the same in choice as the Continuous knob (C), but are operating only on the alternate 3 second cycle of the MIXED mode.

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## **(E) LEVEL CONTROL KNOBS**

The four knobs on the top of the electro-stimulator machine are the controls for the level of electricity distributed to the patient. This can also be called the “strength”, the voltage or amplitude. Simply, as you turn this up more and the patient is connected, he/she feels it more.

These knobs are not connected to each other, and are independent. If you adjust one, you will not cause the others to be effected. This is very important as a feature. They should be turned down, after each treatment, and prior to each treatment. A treatment should never begin without these knobs all being turned all the way to the left, or “0”. You can feel a click when you have completely turned the knobs to “0”. Then, as the needles are hooked up, the knobs can be slowly turned to the right, or turned up.

A very smooth adjustment is built into the level controls. If you move the knob slowly, the perception of electrical stimulation felt by the patient will very gradually increase. This allows you to carefully adjust the proper amount of power to give each pair of acupuncture points.

Please refer to your clinical application information on how much stimulus is therapeutic. Typically, the level control knobs (E) will be turned up, until the patient reports slight discomfort, and then they will be backed off, or turned down slightly.

The level control knobs control both the milliampere and the microcurrent outputs at the same time.

## **(F) OUTPUT TESTER - located on the left corner of top panel**

You may test the output of any milliampere (L, see pg.6) or microcurrent (K, see pg.6) output. This tells you that there is a stimulus coming out of the machine and that the output jacks are operating. Occasionally, you need to determine if both the clip leads and the outputs are operating. You may suspect the operation of either. With the Clip lead tester (M) and output tester (F), you can check both. This is very useful.

Simply insert the alligator clip plug into any output channel (K) or (L). Turn on the MODE knob (A) to Continuous. Then turn up the level control knob (E) of the corresponding output channel.

Attach the clips of the alligator clips to the Output Test (F) connectors. The red and black lead can go on either connector. If the output is working, that is, if there is an output, then the diagnostic green light (G) will light up with each electrical impulse. Thus, the diagnostic (G) green light will be pulsing at the same time as the PULSE (H) green light.

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## (G) DIAGNOSTIC LIGHT FUNCTIONS

The diagnostic light is labeled “DIAG.” on the front panel.

The following is a summary of the diagnostic light functions:

<b>Testing Feature</b>	<b>Appearance of Light (G)</b>
1) Safety is ON, and machine will not operate (due to output level controls (E) being above “0”)	Solid RED and beep
2) OUTPUT TEST (working)	Blinking GREEN and Pulse light (H) YELLOW
3) Automatic Battery Test	Slow blinking red (need to replace battery) and hear a beep
4) Manual Battery Test	Solid green if battery good (solid red light if bad)
5) Clip lead tester	Solid green if clip lead is good (no light if bad)

## (H) Pulse Light

Light pulses with each electrical impulse sent from the output channels through the wires to the needles.

## (I) Continuous Frequency Indicator light

This yellow light will be ON when the position of the continuous freq. knob (C) is determining the output pulse frequency. When the MODE knob (A) is on the “cont.” selection position, this light will always be ON. When the MODE knob (A) is on “mixed”, this light will be “ON” one half of the time, at three second intervals, and the MIXED (D) frequency indicator light will be on the other half of the time. When the MODE knob (A) is on “disc”, this light also is on half of the time, at three second intervals.

## (J) Mixed Frequency Indicator light

This yellow light appears ON when the MODE knob (A) is set on “mixed”. It will light for half the time while the other half of the time, the Continuous Freq Indicator (I) will be ON, alternating in 3 second intervals.

## (K) Microampere Outputs (see picture on pg 6)

The microampere or microcurrent outputs are located on the bottom row of the front side panel.

The microcurrent outputs operate at the same time with the milliamper outputs. The level control knobs will adjust the microampere and milliamper outputs at the same time.

The current level is adjusted by the level control knobs (E). The level control knobs are labeled 0 through 6. This will correspond with the microcurrent level 0 microamperes to 600 microamperes. Thus, the level control knob set at a level of 3 will yield a microcurrent output level of 300 microamperes.

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## (L) Milliampere Outputs (see picture on pg 6)

The milliampere outputs are located on the top row of the front side panel. They are labeled.



## (M) CLIP LEAD TESTER

You may test the integrity or conductivity of your alligator clip leads with the Clip Lead Tester. This is located on the top side panel (where the outputs are located), bottom row, far right. It is labeled Clip Lead Tester. To use this, insert the plug of the alligator clip to be evaluated, into the Clip Lead Tester port or jack. Then, switch the MODE knob (A) to Battery Test. With the alligator clip plug inserted into the Clip Lead Tester, the diagnostic light should be OFF. However, just touch the metal alligator clip leads together, and the green diagnostic light (G) will come ON. This indicates that the alligator clip lead is good, and conducts electricity.

## AUTOMATIC BATTERY TESTER

The diagnostic light (G) will blink red, slowly, when the battery is below 6 volts. This will happen automatically, and will occur when the battery is low, and the MODE knob (A) is on a selected function other than OFF. If the battery is extremely low, below operational level, then the automatic battery tester cannot operate.

## BATTERY CHANGING

The batteries' compartment is located on the underside of the machine. You have to insert your nail or flat tool and press against the groove to open the small door. There are two 9 volt batteries.

**IMPORTANT:** These batteries are placed in carefully with the positive terminal and negative terminal in a marked position. Do not violate these markings. Place the batteries in properly.



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## MicroClip Description and Operations

MicroClips are designed to achieve a solution to some simple yet important problems associated with electro-acupuncture stimulation. Typical alligator clips are too large for use with needles inserted into delicate skin tissue. They will bend and pull needles out of skin and are awkward. The jaws of the alligator clips are also imprecise in making electrical contact with fine needles. MicroClips solve both these problems.

MicroClips are made from three primary components, the clips, the wire, and the plug. Each is designed to provide a light, reliable, and long lasting device.

The plug is the component that fits into the stimulator. The wire connects to the plug, and this is provided with a strain relief heat shrink, this prevents the movement of the wire during flexing, and prevents breakage at the plug.

The wire is 28 gauge biomedical wire, and is designed to be light, yet strong.

The micro clip itself is the smallest clip commercially available. This clip gives a strong attachment action to the needle, is long lasting because of its simplicity and strength, and because it does not have “alligator teeth”.

Standard alligator clips suffer from having teeth that must mesh together to contact the needle. These teeth become unstable over time, and it is usually evidenced by an inability to grab the needle. Under these circumstances, the needle will slip, and make intermittent contact with the needle, which can cause a shock to the patient as the electrical contact is broken suddenly remade.

The MicroClip will always grip the needle firmly, as it does not have teeth. It has a smooth, lightly curved surface with lightly serrated grooves

**It is important to place the needle half way into the jaws of the clip. If the needle is placed completely into the rear of jaws of the MicroClip, the needle will slip. The rear of the clip jaws spread apart, and will not grip the needle.**

It is important for the “care and feeding” of MicroClips that the wire not be bent sharply or kinked, that they not be stepped upon, and that they be handled gently.

The Pantheon Electrostimulator has a built in clip lead tester on the bottom front panel of the device. Using this tester, you can test the integrity of the clips for conductivity.

Our clips are under full warranty for 3 months, and we will gladly replace them if malfunctioning during that time period. We are also happy to attempt the repair of MicroClips at any time after the 3 month period with a parts and mailing charge associated with the repair.

These clips are very superior to normal alligator clips, and are capable of having a long functional life. They are the most delicate component of electro-acupuncture equipment, and take a little care and soft touch, but the payoff is longer lasting equipment. Thank you for your purchase of our MicroClips, and if we can be of any service, please call immediately. We want to assist you in making MicroClips an advantage in your electro-acupuncture applications.

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## General Protocol for Performing Electro-Acupuncture

- Clean body points with alcohol
- Insert needles and acquire qi or apply TENS pads.
- Adjust electro-stimulator for desired frequency and waveform type:
- Make sure Mode knob (A) is set to OFF and all six level control knobs (E) are at zero.
- Plug clip or TENS leads into the electro-stimulator
- Attach MicroClips or alligator clips to the needles for acupuncture.
- Ask patient if everything is still comfortable.
- Set the MINUTE TIMER (B) to the desired time limit. If 10 min, just leave as is.
- Turn the MODE knob (A) on the electro-stimulator to the desired mode: Continuous, Discontinuous or Mixed (double-check that the level control knobs (E) are clicked off to zero) At this point the TIMER has begun its countdown.
- Tell patient which pair of points will be stimulated first, what they can expect to feel and what responses they should give. For example, “We’ll start with these points ...here ... and here. I’m going to slowly turn up the intensity, and I want you to tell me when you first start to feel ... a light tapping or tickling sensation” (for very slow frequencies) or “a light buzzing or tingling sensation” (for higher frequencies).
- **SLOWLY** turn up intensity with the Level Control knob (E) until the patient feels electrical stimulus.
- If using stronger stimulation, ask the patient to tell you when the stimulus gets strong but still comfortable. It should not be painful. Also remind them to tell you if it gets sharp. **SLOWLY** increase the intensity until the patient tells you it is strong enough for them.
- Repeat the process for each channel used.
- The intensity felt by the patient will generally diminish over time, so, if necessary, **SLOWLY** increase until the patient says it’s strong enough again.



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## **When ready to stop treatment:**

- When the timer turns off, a beeper will sound off.
- Turn each level control knob (E) channel down **part way**. Then turn each level control knob (E) channel all the way down until it clicks off.
- Turn MODE knob (A) to OFF
- Disconnect clips or lead wires from the needles/TENS pads (You may also remove the needles/TENS pads, then unclip)
- Remove needles/TENS pads if you haven't already
- Unplug wires from the electro-stimulator.
- Store or hang all wires straight when not in use. Tightly coiling or wrapping wires around machines will lead to premature breakage and wire failure. Periodically check wires with clip lead tester to ensure their safe use and patient comfort.

## Contraindications for Electro-Acupuncture

- Use with pacemakers (potential cardiac problems)
- Transcranial stimulation (epileptic possibility with 10 – 13 hz)
- Current across the spine, horizontally
- Stimulation across the chest region
- Stimulation over the neck region to prevent laryngospasm
- Profound analgesia induced by E-A puts patients at risk of self injury, must be advised or restricted from strenuous physical activity after treatment.
- Use with imbedded neural stimulators
- Lower body points during pregnancy, especially during third trimester
- High frequency or high amplitude application may induce stress, which is contraindicated in cases of hypertension
- E-A can over sedate older patients causing risk of falling asleep after treatment. Patient should be driven to and from clinic.
- Excess E-A can produce tolerance by depleting central serotonin.
- Benign and malignant tumors

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## Why buy the Pantheon Research Electro-Acupuncture Stimulators?

- 1) Pantheon Research Electro-Acupuncture Stimulators are the only **US made** devices on the market. We are therefore accessible to our clients for technical support service, and high quality is built into the products.
- 2) Our equipment is sold with a **one year warranty**, which covers parts and labor. Since we are in the U.S., repairs can be made easily and returned promptly to the customer.
- 3) Pantheon Research can **offer customer service** directly. Customers are welcome to call us with questions about the machines, and we will answer all questions about technical issues. Clinical applications of electro-acupuncture are frequent topics of inquiry, and we make an attempt to assist with these questions. We are not acupuncturists, and make no claims to authority in expertise with clinical applications. We can refer customers to reference materials and provide reference materials to distributors.
- 4) Our Electro-stimulator line of devices is **extremely reliable**. They are well built, well thought out, engineered to a high standard, and are dependable. They can be expected to have a very long functional life. Consequently, they are an asset to a business that offers electro-acupuncture therapy. They can be relied upon to function after years of use, and to be safe and effective with patients.
- 5) Pantheon Research Electro-stimulators are built with **advanced features** and unique features unavailable in other machines. It is important that acupuncturists have equipment with the features provided by the Pantheon equipment.

### Features *unique* (not available on any other machine) to Pantheon Research Electro-Acupuncture Stimulators

- 1) **Frequency accuracy of 99.94%**. That is a less than .06% error. No other electro-acupuncture equipment manufacturer can make this claim for the entire range of frequencies within a specific device. Scientific research requires the highest standards of accuracy and integrity.
- 2) **Safety Mechanism**. All outlets must be turned OFF before the power can be turned ON. This ensures no surprise or pain to your patient should the outlets still be on from a previous treatment.
- 1) **Self diagnostic features** For the safety of your patients and the effectiveness of your treatments, you can: test the operation of the clips and lead wires; check and validate the functioning of a specific outlet; be alerted when the battery is low and needs replacing
- 2) **Ergonomic Design** Redesigned for better readability and operational comfort.
- 3) **Battery Power** Less power is required for E-Stim operation, resulting in longer battery life.
- 4) **Most effective waveform for treatment**: Our “acupuncture waveform” selectable by switch, is a *symmetrical biphasic* waveform. This is the best waveform to use with needle electro-acupuncture (see appendix notes by Pomeranz). This is the most effective physiologically. It is also the **most comfortable**, and delivers the least pain and discomfort to the patient. To sensitive patients, this waveform is a real advantage in treatment as it is very comfortable.

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- 5) **TENS compatibility:** We incorporate a tens capable waveform that is selectable with a switch. This waveform may also be used for electro-acupuncture if either an asymmetrical waveform or more power in stimulus is desired.
- 6) **Microcurrent outputs specifically designed for electro-acupuncture:** Available in models 6c.Pro, 8c.Pro, and 12c.Pro, this microcurrent is designed for use with needle stimulation. There are two main types of microcurrent waveform. These are 1) Physiotherapy appropriate microcurrent (applied with large electrodes to the skin surface, either tens pads or Q-tips pads), and 2) Pantheon Research microcurrent, which is designed to be used for needle stimulation (see appendix for technical discussion). We offer the only electro-stimulator that uses electro-acupuncture (or percutaneous needle stimulation) appropriate microcurrent.
- 7) **Calibrated frequencies:** In all Pantheon models specific therapeutic frequencies are switch selectable and are calibrated to scientific accuracy of 99.94%. Frequencies range from .5 Hz to 200 Hz.
- 8) **Mixed Mode frequency is fully calibrated and adjustable:** The mixed mode, or dense disperse, causes the machine to alternate between frequencies every three seconds, switching back and forth between two separate frequencies. Each of these discrete frequencies is selectable.
- 9) **Clip Lead tester:** The clip lead tester solves a problem no other machine can; testing the integrity and usefulness of an alligator clip assembly. It will test if a wire and clip assembly is working.
- 10) **Great features with small size:** The Pantheon Electro-stimulators have the most professionally useful features providing electro-acupuncture therapies to patients yet are small enough to easily fit on a treatment table or to be carried.
- 11) **MicroClips:** We are the exclusive providers of the Pantheon Research MicroClip. This is the smallest, most reliable electrical clip available on the world market. It is ¼ the weight of a standard alligator clip. It does not use teeth to grip a needle; consequently, it is highly reliable when gripping a needle.

## Additional features of the Electro-stimulators

- 1) **Independently controlled channels:** No output channel will interfere with another when being turned up or down. There is no “cross talk” between channels.
- 2) **Modes of operation include:** Continuous, mixed, and discontinuous
- 3) **Battery tester**
- 4) **Four clips provided with each machine:** Two alligator clips, and two MicroClips
- 5) **Battery included:** two Duracell batteries for extended battery life

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## Appendix

### Discussion of Symmetrical biphasic waveform

Taken from Basics of Acupuncture, G. Stux and B. Pomeranz, 1998, Springer, pp. 272-273.

“Generally the red lead of each pair of wires is positive, and the black is negative. Pulses of electricity are applied to the needles in order to stimulate nerves, with the pulse width being from 0.1 to 1.0 ms in duration (Some stimulators have adjustable pulse width). More expensive, elaborate stimulators use biphasic pulses (negative followed by positive or vice versa) in order to reduce polarization of each needle due to electrolysis. (The negative pulse cleans the electrode of electrolytes deposited by the preceding positive pulse.) **If the pulses are perfectly biphasic, then the net DC current is zero and no polarization occurs.** Polarization is a nuisance as it raises the electrode resistance over time, thus reducing the intensity of stimulation. Also, it can cause the needle to break off in the tissue.

Another advantage of biphasic pulses is that the two needles of each pair receive symmetrical stimuli (one needle being the mirror image of the other). Hence the red lead has a positive pulse followed immediately by a negative pulse, while the black lead has a negative pulse followed by a positive pulse. Since negative pulses cause an action potential on the nerve, it is important that both needles in a pair receive negative pulses, which is only possible in a biphasic stimulator. The intensity of stimulation is under the control of an intensity knob. In less expensive stimulators in which the biphasic pulses are not perfectly matched (the negative wave is not equal to the positive wave); the negative, black lead will give a stronger needle sensation than the positive, red lead. In order to achieve an optimum effect for acupuncture analgesia, the strongest tolerable intensity is required for DeQi (to activate type II and III muscle nerves). **If both leads of a pair deliver symmetrical, biphasic pulses then both needles will be optimally stimulated to give De Qi.** With less expensive devices, however, only one needle of a pair is adequately activated (the needle attached to the black lead).”

### Discussion of Microcurrent waveform

(available on the Electro-Stimulator 6c.Pro or 8c.Pro only)

Microcurrent electrotherapeutic devices have been in the market for many years, and they are normally designed to be used with TENS pads, and Q-Tip cotton probes. These electrodes are applied to the external skin, and are physical therapy or physiotherapy applications. When touching acupuncture points, a similar effect to electro-acupuncture occurs.

The classic microcurrent waveform is called a square wave, and it is also denoted by the technical description: 50% duty cycle square wave. This will be explained subsequently. **Microcurrent stimulators that are designed for electrodes that are attached to the skin may not be appropriate or safe for use with electroacupuncture with needles inserted into the body, or percutaneously.**

Pantheon Research electro-stimulators are designed with a microcurrent square wave that is fully safe and effective when used with percutaneous needle stimulation, as used during electro-acupuncture. This waveform is slightly different, and not the same as the 50% duty cycle waveform. The electro-acupuncture compatible waveform has a much faster pulse time than 50% duty cycle, about 5% or less (See Figure 1, pg 14).

Classical microcurrent devices for physical therapy apply the electrical stimulus to large electrodes, either a TENS pad or a Q-Tip cotton probe. The surface area of these electrodes is large, and the electricity is passed through the epidermis. The large surface area of an electrode means that the current density is small. That is, the available electrical current is divided by the surface area of the electrode that touches the skin. In addition, the

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stratum corneum of the skin has a very high resistance to the passage of electricity. This also reduces the current passing into the body. This is a very safe technique, and very therapeutic for many problems.

However, if this very safe 50% duty cycle square wave is passed into the tip of a needle inserted subcutaneously, different conditions occur. The surface area of a needle tip is very small, and the available electricity is divided by the area of the needle shaft, or possibly the needle tip, under certain conditions. Thus, the current density is large in comparison to a 1 inch square TENS pad. Also, the resistance of the skin is not present.

The problematic condition is most acute when a very slow frequency is being used. Very slow frequencies are most common in electroacupuncture. These are .5 Hz, 1 Hz, and 2 Hz. At 1 Hz, with a 50% duty cycle, the positive pulse will be .5 second in length. At .5 Hz, the positive pulse will be 1 second in length. This begins to appear as DC current, with these slow frequencies, and the problems of electrolysis are possible.

Electrolysis will result in the metal components of the needle being electrically forced into the tissues, and the formation of gas bubbles under the skin and in tissue.

The following quote is taken from the paper by Yoshiaki Omura printed in Acupuncture and ElectroTherapeutics Res. Int. J., Vol. 12, pp. 201-225, 1987, entitled Basic Electrical Parameters for Safe and Effective Electro-therapeutics (Electroacupuncture, TES, TENMS (or TEMS), TENS and Electro-magnetic Field Stimulation with or without Drug Field) for Pain, Neuromuscular Skeletal Problems, and Circulatory Disturbances:

“Undesirable Electrolysis Phenomena Associated with DC Stimulation or Prolonged Application of Electrical Impulses with Excessively Large Pulse Width”

Prolonged electrical pulse stimulation with excessively wide pulse duration or DC electrical stimulation with a significantly large current may result in the following undesirable electrolysis phenomena: 1) strong acid (HCL) formation around the positive electrode and strong alkaline (NaOH) formation around the negative electrode, which may result in necrosis of tissue around the electrodes, 2) hydrogen gas bubbles formation around the negative electrode and oxygen gas bubble formation around the positive electrode as a result of the electrolysis phenomena of water molecules in the body tissue which reduces the effectiveness of the electrical stimulation by decreasing current, as well as 3) breakage of the positive electrode after prolonged application of large DC currents.”

With a very slow frequency, we may have excessively wide pulse duration with significantly large current, especially since the needle tip may be the location of the current movement. The 50% duty cycle microcurrent stimulation has been used now for a few years in electroacupuncture applications, and there have not been widespread reports of electrolysis effects. However, when introducing a new technology into medical practice, a conservative design philosophy is safest and best, until the years pass and all technical issues can be examined. The safety of patients is always the priority.

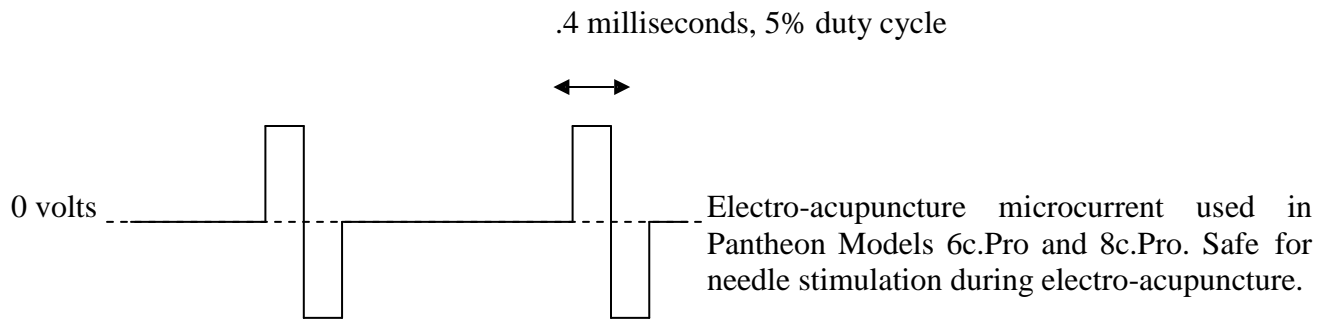
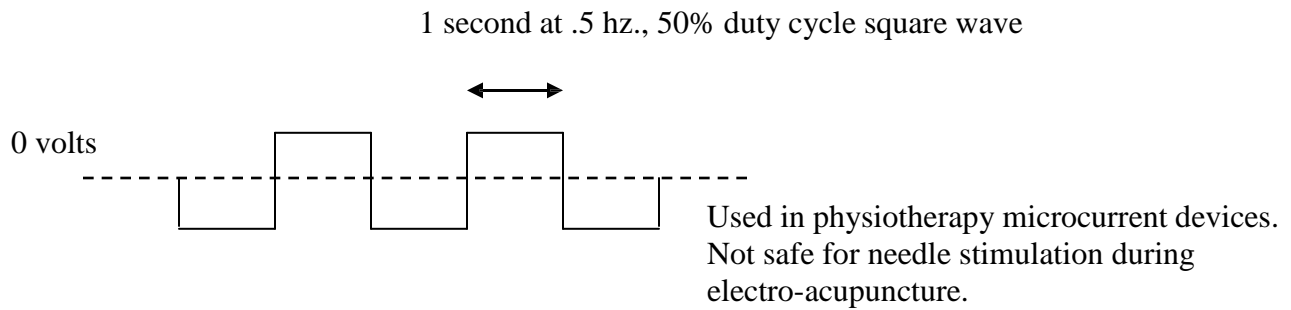
Whereas theoretically, a potential problem exists with the use of 50% duty cycle current, it has been the practice of Pantheon Research to design a system that is not in question. The microcurrent waveform used has a pulse time of only .4 milliseconds, even at very low frequencies. This corresponds to a duty cycle of 5% or less. This is analogous to standard pulse times on electroacupuncture machines, and is safe. The illustrations below demonstrate the images of the waveforms as seen on an oscilloscope.



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Figure 1



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## Electro-Acupuncture Resources

### Recommended Internet Web sites

- **pubmed.gov**  
This is Medline, in easy to use format. Doing a search on **ELECTROACUPUNCTURE** will yield 1163 citations.
- **Medicalacupuncture.org**  
Website of the American Academy of Medical Acupuncture. This site has an online journal, and full articles can be accessed directly. It is a very interesting source. Also a full list of journals, organizations, and online resources is present.
- **Acubriefs.com**  
A search on **ELECTROACUPUNCTURE** provides 1394 citations. This site accesses many traditional journals of acupuncture, and may be more thorough than Medline.
- **Acuall.org**  
Sponsored by the National Acupuncture and Oriental Medicine Alliance.
- **Acupuncture.com**  
Summarizes pertinent information from multiple resources.
- **Med.auth.gr/**  
Includes web journals, articles, databases, and more.
- **medmatrix.org**  
Clinical medical resources, including numerous medical journals.
- **www.nih.gov/pubs/cbm/acupuncture.html**  
National Library of Medicine.  
Current Bibliographies in Medicine-Acupuncture
- **Pantheonresearch.com**  
Includes information on electro-acupuncture products and guidelines

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## Operation Instructions

### Facial/Grounding Stimulator Probe \*\*

Thank you for purchasing your new Pantheon Research Facial Stimulator Probe. This probe is designed to allow the introduction of electrical impulses coming from an electroacupuncture stimulator into the skin of a patient, simply and non-invasively. It is commonly utilized to stimulate regions of the face as a technique to eliminate the use of needles.

This probe is compatible with any stimulator that has a standard 3.5 mm. output jack. This is most electroacupuncture stimulators, as well as the Pantheon Research Stimulator models 4/C, 6/C, 8/C, 12/C PENS, and all Pro series.

The operation of the probe is very simple. A saturated Q-Tip is snipped off with scissors, just below the cotton. This Q-Tip tip is then inserted in the end of the probe. The probe is stainless steel, and will not corrode from the contact with water.

The electroacupuncture machine may be turned up to an appropriate level of milliamperere output power on the acupuncture or TENS setting at a low frequency of 2 or 5 Hz. The probes may then be applied to the face.

As skin becomes moistened or hydrated by the action of the water in the Q-Tip, it will more effectively conduct electricity into the skin. The patient may feel the electricity more distinctly as time passes, as the cotton tip is held against one spot.

The Q-Tip should be discarded after a treatment.

The probes may be used on any part of the body in place of needles.

\*\* - Optional, available for purchase

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## Warranty Policy

Thank you for your purchase. We are here to be of service to you in any way we can. The following outlines our warranty policy. Please call us if you have any questions. We very much look forward to speaking with you.

### **Full one year warranty**

For one year from the date of purchase, if this Electro-stimulator fails due to a defect in material or workmanship, Pantheon Research will repair it free of charge.

### **90 Day Warranty on Microclips, Alligator Clips, Facial Probes**

### **Return Policy**

The electro-stimulator can be returned for up to 30 days from purchase date for a full refund.

### **What is not covered by this warranty**

1. Conditions and damages resulting from any of the following:
  - a. Improper maintenance
  - b. Any repair, modification, alteration, or adjustment not performed by a Pantheon Research servicer.
  - c. Misuse, abuse, or unreasonable use.  
Ex. Any liquids such as oils that have spilt into the machine
2. Warranties are void if the original serial number has been removed, altered, or cannot be readily determined.
3. Battery
4. Shipping cost to send Electro-stimulator to Pantheon Research

**To receive Warranty Service please call us first.** We often can trouble shoot the problem over the phone. If we are unable to solve the problem over the phone then send your electro-stimulator to:

**Pantheon Research  
626A Venice Blvd.  
Venice, CA 90291**

Be sure to include the following information:

Your name, address, telephone number;

A clear description of the problem you are having.

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## MICROCURRENT THERAPY – an overview

Excerpts from the following articles: “*Microcurrent Therapy- What Is It All About?*” published in the Cramer First Aider, Volume 62, Number 1; “*Microcurrent Therapy- Part II*” published in the Cramer First Aider, Volume 62, Number 2; and “*Microcurrent Therapy- Does Polarity Make a Difference?*” published in the Cramer First Aider, Volume 63, Number 3. Authored by Linda Manley Teahen M.Ed.,A.T.,C., P.T.A.

Electrotherapy has truly become revolutionized in the past fifteen years. Clinicians have begun to change their philosophy from *the more stimulation, the better*, to *lesser is better*, or, *it is more effective to whisper to the cells rather than to shout*, as we have in the past. This new philosophy of electrotherapy, at low-voltage, pulsed microamperage levels, is referred to as **Microcurrent Electrical Neural Stimulation**.

Microcurrent is a subtle but very powerful current. The treatment levels are usually subsensory (below the level of sensation). Researchers believe that the effects expected to occur are at the electrochemical level within the body's tissues; literally at the cellular level. More often than not, the patient will not feel the current to achieve desired results as many patients have been programmed in the past. The "no pain, no gain" theory, is not true for Microcurrent Therapy. At most, the patient may feel a slight tingling or warmth in the treatment area.

Because the current is often not felt during treatment, it is sometimes an obstacle in convincing patients that treatment is actually occurring. Patients must be reassured that even though they may be used to a muscle contraction, that this modality is a different type of current with far different physiological effects.

In comparing Microamperage to Milliamperage, Microamperage is a much smaller current;

**1 Microamp (uA) = 1/1000 of a Milliamp (mA)**

**or**

**1000 Microamps = 1 Milliamp**

Milliamperage current as you know is traditionally used in electrotherapy modalities such as EGS and TENS. Milliamperage can produce a muscle contraction, whereas Microamperage current density cannot excite motor nerves and therefore cannot produce a muscle contraction.

There are several theories and hypothesis as to how Microcurrent works. Researchers in biological electricity and regeneration such as Dr. Robert O. Becker and Dr. Bjorn Nordenstrom, have indicated that Microcurrent may have the ability to stimulate the healing process as well as aid in pain control. Dr. Becker has authored two books, "The Body Electric" and "Cross Currents". These books discuss electrical currents in the body as well as in the environment and its effect on living tissue in the human body.

One of the most widely used studies on Microcurrent amperage is by Ngok Cheng, MD entitled "The Effects Of Electric Current On ATP Generation, Protein Synthesis and Membrane Transport in Rat Skin." This study, conducted in Louvain, Belgium produced some very interesting results which appear to be applicable to the Arndt-Schultz Law, the underlying theoretical concept of low-volt pulsed Microamperage Therapy.

***Arndt-Schultz Law states: "Weak stimuli increase physiological activity and very strong stimuli inhibit or abolish physiological activity."***

The results of this study showed the following:

*"Electrostimulation of the tissue resulted in remarkably increased ATP concentrations. With currents from 50 uA to 1000 uA, the ATP levels were increased threefold to fivefold. With currents from 100 uA to 500 uA the stimulatory*

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*effects were similar. With currents exceeding 1000 uA, the ATP concentration leveled, and with 5000 uA, they even were reduced slightly as compared with the non-treated controls.*

Similar effects were also noted in regard to protein synthesis. At about 500 microamps there is a tremendous enhancement but when you get over 5000 microamps (5 milliamps), the trend reverses into suppression.

This does not mean that other previous forms of electrotherapy are not effective but it does indicate that if we are looking for results beyond those of pain relief, for example, stimulation of the healing process, then perhaps we must look deeper into Microamperage stimulation and its clinical efficacy.

The following is a simplified explanation of the cell physiology of muscle trauma and the potential effects of applying Microcurrent to the area:

When a muscle sustains a trauma, it goes into spasm as a protective response. Muscle spasms decrease the blood supply to the area, which reduces the amount of oxygen and foodstuffs that are able to reach the cells. In addition, metabolic by-products accumulate because muscle spasm results from tonic activity.

Therefore, trauma to a muscle decreases ATP, disrupts the sodium pump, and increases metabolic wastes. All of these events are perceived by an individual as pain. When ATP is replenished in the injured tissues, the membrane active transport is increased, thus allowing the intracellular flow of nutrients and the extracellular flow of waste materials. This process allows the emergence of healthy tissue. ATP also provides the energy source that tissues need to build proteins. MICROCURRENT therefore, initiates the healing process by replenishing ATP, increasing the membrane transport of ions, and facilitating protein synthesis<sup>1</sup>

It had been observed by Galvani in 1792 that injured tissues generate electrical currents that differ from those of healthy cells. It is also known now that electricity plays a vital role in cellular function. By altering the internal electrical signals with an external electronic microcurrent, it may be possible to regulate the growth, development, and repair of injured tissues.<sup>1</sup> By adding artificial external microstimulation that is similar to the body's physiologic electrical currents, the body's homeostatic mechanism can be facilitated, thus setting the stage for healing and recovery.<sup>2</sup>

According to Dr. Robert O. Becker, in a healthy state, the body is normally polarized relatively electropositive along the spinal axis and relatively electronegative distally. This polarity is reversed in hypnosis during anesthesia and following an injury which creates a positive potential at the site of trauma and injury, which reverses the normal polarity in the body. As Dr. Becker speculates, this sets up a current of injury which initiates and signals the beginning of tissue repair and regeneration. Dr. Becker believes that this current of injury is conducted by means of direct current signals conducted throughout the Schwann cell and Glial cell sheath surrounding neurons. He also speculates that so-called acupuncture points may actually be amplifiers along this d.c. system compensating for downstream signal damping as the signal diminishes in strength as it proceeds distally, and thus perhaps the stimulation at these acupuncture points is a means of amplifying these bioelectric signals which can in turn enhance the signaling of tissue repair and regeneration.

There are many books, articles and studies that have become available to clinicians for further explanation of the theories behind the application of Microcurrents. A bibliography can be found at the end of this article to assist you in locating additional Microcurrent studies and abstracts.



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## **GENERAL CLINICAL INDICATIONS**

Microcurrent instruments are FDA approved for marketing as a Class II device in contrast to a Class III device which is experimental. Microamperage is approved under two categories: both as a transcutaneous electrical nerve stimulation device as well as an electronic muscle stimulator.

### **MICROCURRENT THERAPY HAS BEEN USED TO TREAT THE FOLLOWING:**

Chronic and acute pain, swelling, musculoskeletal dysfunctions, soft tissue injuries, synovitis, arthritis, fractures, disc disease, neuropathies, temporalmandibular joint dysfunction, intractable pain syndromes, wound healing and post-operative care.

## **GENERAL CLINICAL CONTRAINDICATIONS**

The Food and Drug Administration restricts its use for pregnant women and should not be used in individuals with demand-type cardiac pacemakers. It is not recommended for use with wound infections, through malignant (cancer) or benign tumors, through the eyeball, through the carotid sinuses, or on pain syndromes that are undiagnosed until the etiology has been established.

## **WARNING**

This device should be used only under the direction and supervision of a physician or licensed medical professional. The user should keep this instrument out of the reach of children. Do not use or store this instrument in the proximity of an operating diathermy instrument.

## **PRECAUTIONS**

Care should be taken when treating areas of low or impaired sensory response, or patients unable to report discomfort or pain in the injured/treatment area.

## How Microcurrent Stimulation Produces ATP -- One Mechanism

by Steven Bailey, DC

ATP (adenosine triphosphate) molecules are the storage and distribution vehicles for energy in the body. The breakdown of ATP into ADP yields energy. It is the cleaving of the phosphate bond that yields the energy. This energy is utilized in almost all energy related cellular reactions. In addition to being integral to the function of virtually every cell in our body, we may also look at ATP function by categories of activity. Such essential functions include: 1) muscle contraction; 2) protein biosynthesis; 3) nerve transmission; and 4) active transport across cell membranes.

In muscle contraction, the process occurs as such: each muscle spindle is composed of muscle fibers. Inside the muscle fibers are many muscle fibrils. These muscle fibrils are suspended in a fluid matrix called sarcoplasm. Suspended in the sarcoplasm are thousands and thousands of mitochondria, which contain large amounts of ATP.

It is ATP that energizes the muscle contraction process by the ATPase activity of the exposed myosin head. When ATP is exposed to the myosin head, it is cleaved and energy is released. It should be noted that along with ATP, magnesium is very necessary in ATP energy releasing reactions. Before ATP can become "active ATP," magnesium must bind between the second and third phosphate. Clinically, magnesium deficiency may be related to such conditions as fibromyalgia and chronic fatigue syndrome.

Synthesis of almost any chemical compound requires energy. That energy is ATP, which is critically important to the biosynthesis of proteins, phospholipids, purines, pyrimidines and hundreds (if not thousands) of other substances. We will take ATP involvement in protein synthesis as a case in point: a single protein may be composed of many thousands of amino acids. It takes the breakdown of four high- energy phosphate bonds to link two amino acids together.

Maximally, two ATP could serve as energy to join two amino acids together, so if our protein is composed of 10,000 amino acids, it may take 20,000 ATP to form just this one protein. It should also be noted that the amino acids themselves utilize ATP indirectly as they are first co-transported into the cells.

ATP is necessary for nerve transmission. Nerve transmission entails the release of nerve transmitter substance from the presynaptic terminal into the synaptic cleft, which simply put is a space between one nerve and another. The nerve transmitter substance spans the cleft and attaches to the receptor of the other cell. The nerve transmitter substance must be constantly formed anew in the presynaptic terminal for future release; the energy for this formation is supplied by ATP. There are many mitochondria in the presynaptic terminal to form and store the ATP for this process. The formation of ATP will be discussed later in relation to the stimulatory effects of microcurrent.

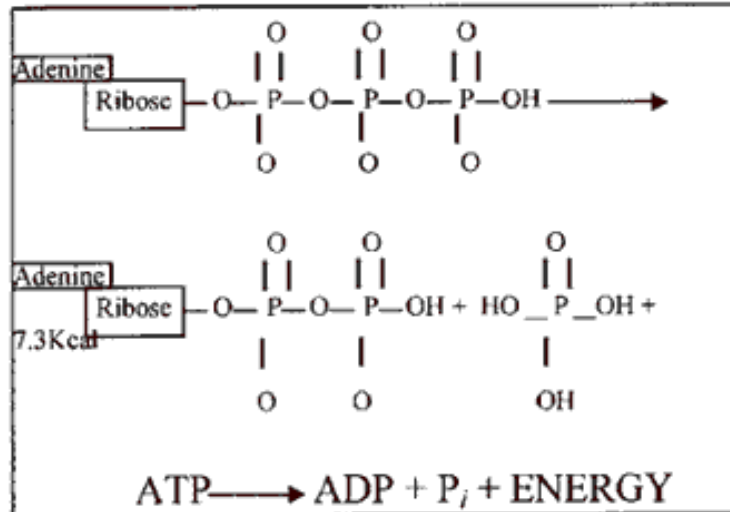
At the post-synaptic terminal, the next nerve cell down the line, it is through active transport of sodium, potassium and calcium that concentration differences across the nerve cell membrane cause nerve firing and propagation of nerve signals to travel to the next presynaptic terminal. These concentration gradients could not be accomplished without ATPase active transport across nerve cell membranes.

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Active transport is brought about by the energy release of ATP in the breakdown of its phosphate bonds (see **Figure 1** for ATP chemical structure and energy releasing breakdown).

**FIGURE 1:** ATP chemical structure, breakdown, and release of energy.



Active transport is a means of getting molecules across the cell membrane, either into or out of the cell, against a concentration gradient. That concentration gradient may be electrical or a pressure gradient. Sodium, potassium, calcium, glucose, amino acids and many other compounds are transported this way.

To summarize, ATP is the energy currency for our bodies. In reality, virtually every cytological, histological and physiological process is ATP-mediated, which makes ATP clinically important. While our bodies in theory can produce all the ATP we need, the fact is that it doesn't. Microcurrent stimulation between 200-800 microamps is a way of supercharging the tissue with ATP, which will reside there until needed. By this means, much of the research that shows a 200% increase in healing rate can be explained as it applies to hundreds of conditions. In a clinical sense, any healing process takes a great deal of ATP and may be accelerated through a means of increasing ATP in the tissue. Microcurrent stimulation accomplishes this by increasing ATP in the tissue by up to 400%.

## Discussion

Microcurrent stimulation to the body causes radically increased production of ATP levels. This allows the body to perform whatever healing process it has undertaken in an accelerated fashion. It may even allow one to get over the proverbial "hump" that was unachievable, due to insufficient ATP concentrations to perform the changes needed.

ATP is the dynamic reservoir of energy in our body. Glucose serves as a more long-term reservoir but in itself does relatively little to fuel the body. Glucose is first converted to ATP. ATP is the storage and distribution vehicle for energy. From the moment an ATP molecule is produced, it is typically consumed within one minute.

The turnover rate for ATP is very high. However, the body does have a vast capacity to store ATP. One can build ATP reserves. This is one reason that, unlike other forms of electric therapy such as interferential, or higher

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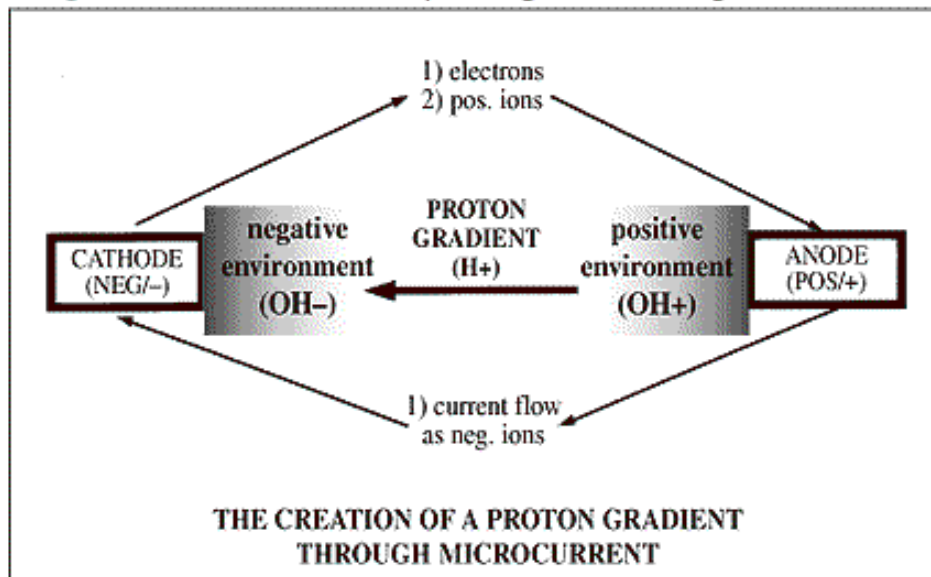
amperage TENS and galvanic, microcurrent stands unique in that it has a cumulative effect, rather than a diminishing effect. Other electric stimulation devices decrease ATP levels.

Moreover, these devices cannot even be thought of in the realms of ATP generation. It has been shown that any stimulation over 1,000 microamps causes plateauing and then reduction in ATP. Microcurrent therapy, which is used from one to usually 600  $\mu\text{A}$  clinically, is the modality of choice for increased tissue healing. Research and clinical trials have shown that with microcurrent stimulation, there is a 40-50% reduction in healing time of ulcers and sprain/strains; fractures heal faster and stronger; and that even bad scarring (keloid scars) remodel to become a healthier, stronger scar. Other ATP related microcurrent stimulatory effects include decreased inflammation, edema and swelling, and increased physical endurance in sports.

Clinically, microcurrent stimulation is not at all limited to its effects of increased ATP production in its capacity as a treatment modality, but its effects to reduce injury healing time in half are truly dramatic. The mechanism for increased ATP production from microcurrent electric stimulation can be explained. In the following text, its mechanism, from the grosser external application down to the molecular level, is revealed.

A microcurrent instrument delivers a direct current (DC), and so the nature of its electrical flow is the same. **Figure 2** is a representation of a typical circuit in which electrons flow from the cathode to the anode, while current, in the form of negative ions, flows from the anode to the cathode. The negative ions can be thought of as an offset to the electrons which flow the other way. This comprises the circuit.

**Figure 2:** The creation of a proton gradient through microcurrent.



Of more clinical relevance is what takes place at the anode and the cathode rather than the circuit itself. Around the cathode, which is negative, is an environment of negative hydroxyl ions ( $\text{OH}^-$ ). This is caused by electron interaction with water molecules at the cathode, hydrolyzing the water molecules into hydrogen and hydroxyl molecules. The same reaction takes place at the anode; however, because the anode is positive in polarity, protons (hydrogen ions) form the environment around the anode.

In the instantaneous moment, both hydrogen and hydroxyl ions are forms around both pad electrodes. However, over time, the ionic environment becomes hydrogen around the anode electrode and hydroxyl around the

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cathode electrode. Because it is hydrogen that leads to the creation of ATP, it then follows that as a residual effect after the microcurrent stimulator is turned off, ATP production continues at the site.

Meanwhile, at the negative electrode, ATP production ceases immediately at the turning off of the stimulation because there is no residual hydrogen cloud in the area. Protons (H<sup>+</sup>) produce a very powerful effect here. Looking at **Figure 2**, we see that the protons diffuse to an area of less protons, namely from the anode side towards the cathode side. As the protons (H<sup>+</sup>) migrate through the tissue, they cause increased formation of ATP.

This ATP formation can be explained through the chemosmotic theory of Mitchell. This theory explains how mitochondria form ATP by familiar processes such as the electron transport chain and Krebs cycle. In Mitchell's theory, we see that ionized hydrogen (protons) trigger the electron transport chain by combining with NADH to form NADH<sup>+</sup>, as well as FAD to form FADH<sub>2</sub> and other mediators. The net effect of each cycle of the electron transport chain is the introduction of six hydrogen ions inbetween the inner and outer mitochondrial membranes.

At this point, hydrogen ATPase is activated by the high intramembrane content of hydrogen and activates ATP production. This is accomplished by the addition of a phosphate group to ADP to form ATP (see **Figure 1**, except note that the process will basically run in reverse to form ATP). This process is known as oxidative phosphorylation. The ATP is at this point transferred out of the mitochondria into the cytoplasm of the cell where it is stored until utilization.

## Conclusion and Afterthoughts

ATP can be produced by the body by many means other than those mentioned above. However, it is a very dynamic energy source, and at the site of injury or at a site of overuse and microinjury, ATP supplies can become diminished.

Microcurrent therapy offers a unique and wonderful answer to tissue healing. Clinically, microcurrent therapy is also a therapy of choice for hyperacute injuries in that it produces little if any sensation. It should also be remembered or known that in addition to its uniqueness, microcurrent therapy shares many of the qualities of other electric therapies: namely for application in pain control, muscle relaxation and nerve re-education. It also stands somewhat unique in its ability to increase vascular permeability and in its use as a means of electroacupuncture. MENS microcurrent instruments have the ability to detect the bioelectric state of the human body, and have proven a standard of technical excellence unsurpassed in clinical modality.

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