How to Use E-Stim with Acupuncture, and why it Works

A Five CEU Hour Course © By Dr. Harvey Kaltsas, A.P., Dipl. Ac. (NCCAOM)
This course will cover the following topics, but they will necessarily be fully compartmentalized as listed below:

1. Instruction in operating battery operated, alternating current, electrical stimulators of milliamp power in a clinical setting for pain control, addiction control, and muscle spasms – including placement and types of clips, and settings of controls: modes, wave forms, frequencies, time, and intensity.
2. Discussion of contraindicated points, frequencies, intensities, and equipment.
   a. The neurochemical and physiologic basis of acupuncture analgesia
   b. Progress in the pharmacological studies of acupuncture analgesia
   c. Progress in the use of acupuncture since the 1970’s
   d. Resources to learn more about electroacupuncture

PART 1.

After showing a recent graduate of an acupuncture college how to treat a sciatica patient with e-stim using a Pantheon Research model 4-C Electro-Stimulator, I was surprised when she asked, “How do you know which needle gets the red clip and which gets the black clip?” She then explained that her Chinese instructors in school always made a big deal about which clip goes where.

This got me to thinking, “Just how little do practitioners know about how to use electrical stimulators, and what kind of stimulators are other practitioners using?” I thought this because there is no basis in electronics or human physiology for differentiating between the red and black clips when using a stimulator that delivers an alternating current (AC), perfectly balanced, biphasic square wave, the type of stimulator that should be found in most acupuncture clinics. More on this later.

To launch right into this topic, I presume and pray that no one is attaching clips from stimulators that deliver net direct current (DC) onto acupuncture needles. Except when treating cancerous lesions with electro-cancer therapy (ECT), in itself a serious topic for lengthy study, such DC stimulators should only be used with TENS electrode pads or with a hand held ground and a metal or moistened Q-tipped probe which rests on the skin’s surface.

**Why avoid using a DC stimulator hooked to needles?** The answer is simple. It damages the needles, and you run the risk of breaking them off inside the patient. Running DC or direct current from one acupuncture needle to another creates a migration of electrical ions from one needle to the other. This is what happens with electrolysis or electroplating. Metal ions from a negatively charged electrode transport through a fluid medium (in this case human tissue) to a positively charged electrode, and metal builds up on the positively charged electrode. In practical terms, this means that the needle with the black clip attached gives up pieces of metal which then wind up attached to the needle with the red clip. The black clipped needle becomes porous and weak and can break off inside the patient when retracted. The red clipped needle is both weakened and has metal plated to its side in a jagged, irregular fashion and can rip out human flesh when withdrawn. It’s not a pretty sight.

In addition, when subjected to enough percutaneous DC current, the water in human tissue begins to break down into constituent molecules. Hydrochloric acid (HCL) and oxygen gas bubbles form in the tissues on the way to and around the positive (red) electrode or needle, and sodium hydroxide (NaOH) and hydrogen gas bubbles form around the negative (black) electrode or needle.

Drs. Gabriel Stux and Bruce Pomeranz discuss the matter of DC currents and biphasic square waves in their book *Basics of Acupuncture*, 1998, 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 being from 0.1 to 1.0 ms [milliseconds] 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 the 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 De Qi (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).”

Electric-Cancer Therapy with DC Galvanic Stimulators:

DC or galvanic stimulators do have their place in the practice of acupuncture, but it is a very selective application requiring specialized training. Since 1988 the practice of ECT has spread widely throughout China. In 1992 one researcher, Dr. Xin Yu-Ling, MD, published a report documenting his results treating 2516 patients, and by 1993 it was already being used in 818 Chinese hospitals.

An ECT session resembles a normal electro-acupuncture treatment, but with some differences. The physician inserts a platinum or gold needle into the center of the tumor and attaches a positive, red clip from a galvanic (DC) stimulator. The physician then places silver needles around the tumor with negative, black clips attached, no farther than 1.5 centimeters apart. Voltages of 6 to 15 volts are used, dependent upon tumor size. The most common size of tumor treated is about 3 to 5 centimeters in diameter. Tumors as large as the 5 to 10 centimeter range have been killed with ECT.

Running current and silver ions into the tumor changes the pH within the tumor and basically cooks it, creating heat shock proteins which help the immune system to identify similar cancer cells around the body. In this way, ECT treatment of a local breast tumor can kill a distant metastatic liver tumor.

In China, Dr. Xin Yu-Ling, MD and his associates treated a wide variety of cases with impressive results. At the First International Conference of Bio-Electrotherapy for Cancer held in Beijing in 1992, Dr. Xin reported the following: more than 35% of cases were put into full remission; 43% had partial remissions; 15% showed no change; and in only 7% of the cases did the disease progress during therapy. (See Table 1).

Table 1. Cancer Reduction Efficacy of Bio-Electrotherapy as Experienced by the Administering Oncologists in China - Results from Applying Galvanotherapy to Chinese Cancer Patients
<table>
<thead>
<tr>
<th>Cancer type</th>
<th>Patient Load Number (#)</th>
<th>CR</th>
<th>PR</th>
<th>NC</th>
<th>PD</th>
<th>CR+PR</th>
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<td>#</td>
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<td>#</td>
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<tr>
<td>Total</td>
<td>2516</td>
<td>885</td>
<td>35.2</td>
<td>1080</td>
<td>42.9</td>
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<td></td>
<td></td>
<td>15.1</td>
<td>6.8</td>
<td>1969</td>
<td>78.3</td>
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<tr>
<td>Lung cancer</td>
<td>593</td>
<td>168</td>
<td>28.3</td>
<td>298</td>
<td>50.3</td>
<td>76</td>
</tr>
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<td></td>
<td></td>
<td>12.8</td>
<td>51</td>
<td>379</td>
<td>1080</td>
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<tr>
<td>Liver cancer</td>
<td>389</td>
<td>98</td>
<td>25.2</td>
<td>196</td>
<td>50.4</td>
<td>74</td>
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<td>19.0</td>
<td>20</td>
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<tr>
<td>Skin cancer</td>
<td>366</td>
<td>244</td>
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<td>95</td>
<td>26.0</td>
<td>20</td>
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<td>5.5</td>
<td>10</td>
<td>379</td>
<td>1080</td>
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<tr>
<td>Breast cancer</td>
<td>288</td>
<td>78</td>
<td>27.1</td>
<td>8228.5</td>
<td>59</td>
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<td></td>
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<td>20.5</td>
<td>9</td>
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<tr>
<td>Metastatic lymphoma</td>
<td>190</td>
<td>49</td>
<td>25.8</td>
<td>89</td>
<td>46.8</td>
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<td>Rhabdomyosarcoma</td>
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<td>56</td>
<td>49.6</td>
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<td>16.8</td>
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<td>Malignant melanoma</td>
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<td>Facial tumor</td>
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<td>38.9</td>
<td>29</td>
<td>40.3</td>
<td>11</td>
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<td>Metastases in breast and abdominal wall</td>
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<td>22.7</td>
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<tr>
<td>Thyroid cancer</td>
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<td>24</td>
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<td>9</td>
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<tr>
<td></td>
<td></td>
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<td>3</td>
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</table>

Key: CR is Complete Remission; NC is No Change; PR is Partial Remission; PD is Partial Deterioration

To put these ECT results from China in proper perspective, the American Cancer Society finds a 5% remission rate in response to chemotherapy to be satisfactorily effective. ECT’s 80% remission rate far surpasses the success rate for any chemical or radiologic therapy used in America.

**PROBLEMS WITH OLDER CHINESE STIMULATORS:**

Over the past 36 years I have used many types of electrical stimulators, from “the electric aspirin,” a very crude electric stimulator brought over by NESA founder Dr. James Tin Yao So, to the WQ-10-A, WQ-10-B, and WQ-10-C. All these devices were made in China, and all suffered from the same deficiencies. They were four channel stimulators, but the intensity delivered to one channel was not always isolated to that channel. Sometimes intensity would jump from one channel to another, or there would be discontinuous geometric jumps in amplitude when turning up the intensity dial, and patients would get shocked. Even worse, sometimes current would flow at a high rate even if the intensity dials were set at zero, shocking the patients as soon as the machine was turned on.

Also the wave forms were not necessarily 100% biphasic and certainly not perfectly symmetrical biphasic square waves. That is there could be more current flowing in one direction than the other; thus there could be a net DC current delivered, resulting at times in electrolysis of the needles. Perhaps this is why the convention originated in the 1970’s and 1980’s to attach the black alligator clip to the distal points and red clips to the more proximal points, with practitioners intuitively understanding that current was indeed flowing from one direction to another and not perfectly back and forth as it should have been. Too often the machines broke, and it was very difficult to get them repaired.

**PREFERRED EQUIPMENT:**

**STIMULATORS:**

Ultimately, in the early 1990s, I started buying stimulators form Pantheon Research, I believe it to be the only American based manufacturer of milliampere acupuncture stimulators, and all my troubles with stimulators have since gone away. [No, this is not a paid commercial advertisement. I have no financial ties to Pantheon whatsoever]. The channels in the Pantheon stimulators are completely separated, with no intensity jumps possible
from one channel to another. The wave forms are perfectly symmetrical biphasic square waves, that is the wave form alternates perfectly from positive to negative and negative to positive, obviating any of the aforementioned electrolysis problems associated with DC stimulators. Symmetrical biphasic square waves are also known to be the most comfortable. The machines rarely break down. Of the two machines I own, only one malfunctioned (once) in 18 years – and then it was readily repaired at no cost).

There are several other quality stimulators on the market. Lhasa OMS sells two that employ symmetric biphasic square waves, the ITO ES-160 from Japan and the E600 Han from China. Both have 6 channels, as do some of the excellent Pantheon stimulators. Lhasa also offers three stimulators with asymmetric biphasic square waves designed to minimize electrolysis – the positive side of the wave is a square wave and the negative is a spiked wave. Two are updated versions in the WQ-10 line, the AWQ-105 Pro and the AWQ-104L, and the third is the Model ES-130 from Japan. In my personal experience the Japanese alligator clips are both more expensive and more reliable than the Chinese. This may hold true for the stimulators as well, but I can’t say for sure, since I’ve been using Pantheon’s stimulators for two decades.

**CLIPS:**

There are basically three styles:

1. alligator clips
2. MicroClips™ and micro duck beak clips
3. micro-hook clips

I’m old school and still use alligator clips, preferably those made in Japan since they’re more reliable. Sometimes I’ll fashion my own with supplies from Radio Shack. The advantage of alligator clips is this: they are big enough so that those of us with less nimble fingers can handle and attach them easily. The disadvantage is that they are heavier than the MicroClips and duck beak clips which Pantheon and Lhasa OMS also offer, respectively. When necessary I place paper tape on adjacent skin to secure in place the alligator clips which have been attached to needles. Another disadvantage of alligator clips is that if you attach them to the shaft rather than the handle of the needle, the spaces between the teeth are often bigger than the shaft of the needle, and the clip can make intermittent contact with the needle, thereby breaking the flow of electric current intermittently. To overcome this, I never attach the alligator clip to the shaft but only to the handle, which is always thick enough to accommodate the teeth of the acupuncture needle. This also means that I can never use plastic handled needles when using e-stim.

The advantages of the MicroClips and duck beak clips are that they are light – only ¼ as much as standard alligator clips - and grip firmly no matter what diameter the needle shaft may be. The main disadvantage, for me at least, is that the handles are small and are thus unwieldy at times.

Micro-hook clips attach firmly to the shaft of the needle but some may find them to be a little too small (although they still do fit my clumsy fingers), and they tend to break more readily than alligator clips because the wire inserts perpendicularly into the clip. It breaks there on me sometimes.

**WIRES:**

Thicker is better; 28 gauge biomedical wire is light and strong. Between treatments do not crimp the wires or mash into the plugs which stick into the stimulator as the wires may break. I usually hang mine from a high place so they can dangle. Most machines come with a lead tester so you can ascertain if the plug, wire, and clips are functioning properly.
**EAR PROBES WITH HAND GROUNDS:**
These are inexpensive, ubiquitous, and plug into the various stimulators. Lhasa OMS sells their A4 Pen Probe for $8.50. For $35-$45 dollars Lhasa and Pantheon also sell facial stimulation probes to be used with moistened Q-tips heads into the heads of the probes.

**FREQUENCIES AND WAVE FORMS:**
The safest most comfortable wave form to use is a symmetrical biphasic square wave. This wave guarantees that there will be no electrolysis and is the most comfortable for the patient. Patients tend to experience biphasic waves with negative spikes as being a little sharper when amplitude is turned up. Dr. Ji-Sheng Han et alia conducted research into how “High and low frequency electroacupuncture analgesia are mediated by different opioid peptides.” Basically he found that there are three different basic forms of endogenous opioid peptides (EOP’s) involved in acupuncture analgesia:

1. meta-enkephalin (MEK) and leu-enkaphalin (LEK);
2. beta-endorphin (BEP)
3. dynorphin A (Dyn A) and dynorphin B (Dyn B)

Han concluded that “Different kinds of EOP may be released in the spinal cord by EA stimulation of different frequencies,

- MEK at 2 Hz,
- Dyn A at 100 Hz, and
- a mixture of enkephalins and dynorphins at 15 Hz.”[1]
Han further concludes that “BEP and LEK do not seem to play a significant role in the mechanisms of acupuncture analgesia.”[2]
Enkephalins have their greatest effect on the upper body and head, dynorphins on the spine, torso, and extremities. Thus it’s a pretty safe bet when treating the head and neck to use a combination of 2 Hz and 15 Hz and when treating the lower part of the body to use a combination of 2 and 100 Hz.

**PROTOCOLS FOR USE:**

- The first thing you should demand of an electrical stimulator is that it should run only on batteries. If you have a stimulator that needs to be plugged in, beware! There is always the possibility that it could short circuit and deliver a lethal surge of electricity to your patient. For that reason, I would never attach clips from a plugged in stimulator to acupuncture needles in a human body. This is especially true here in Florida where we have an abundance of lightning storms and consequent unexpected power surges.
- Before attaching clips to the needles, be certain that the machine is turned off and that all intensity knobs are turned down to zero. Otherwise you and your patient can be in for quite a shock.
- Make sure the leads for your clips are plugged into the stimulator.
- Attach the clips to the handles of the needles.
- Adjust the frequency on the machine to be appropriate for the area(s) being treated.
- Double check to see that the machine is turned off and that the intensity knobs are dialed down to zero. Then turn the MODE knob on the electro-stimulator to the desired Mode: Mixed, Continuous, or Discontinuous. I almost always use Mixed mode because it allows one to direct two different frequencies at the tissue, preventing the tissue form accommodating to and tuning out the stimulus. Different frequencies create different forms of endogenous opioid peptides (EOP’s) in the body. More varieties of EOP’s are better for effecting pain relief. Continuous stimulation is similar to that produced by persistent
manual manipulation of the needle, and I use it mostly when doing scalp acupuncture – and at 3 Hz. Discontinuous is similar to intermittent manual stimulation.

- Inform the patient which needles you’ll be stimulating first, then turn on the machine, and SLOWLY turn up the intensity knob. I ask the patients to tell me when they start to feel the stimulation, and I bring the intensity to just above the point whereby the patients can feel it -but below the point where the stimulation is uncomfortable.
- Repeat this procedure for every set of wires used.
- After 10 minutes I turn up the intensity again, slightly, so the patient feels the stimulation again, because usually patients adapt to the sensation.
- Generally I stimulate for 10-30 minutes, no less and no more. This duration is based upon research conducted by Dr. Ji-Sheng Han.
- To end the treatment, turn each intensity knob down part way. Then turn each knob down all the way.
- Then turn the Mode knob to off. This is very important for two reasons. First is that leaving the stimulator on will drain the battery. They are nine volt and cost about $3.00 each. Second, turning the machine off assures that when treating your next patient you won’t attach wires to a machine that’s already on!
- Disconnect the clips from the needles.
- Put the stimulator away in a place where the wires can hang freely.

**TO TREAT VARIOUS DISORDERS:**

1. **PERIPHERAL NEUROPATHY** –
   I’ve consistently had great results over the years treating the following points with 2 and 100 Hz for 20 minutes set on mixed frequency: the Bafeng points attached to Sp 5, Sp 9, GB 34, GB 40.

2. **ADDICTIONS** –
   The following two protocols are taken from and refer to the charts in Terry Oleson’s *Auriculotherapy Manual*. They involve treating with a hand held probe applied to the ear with a ground held by the patient.

   For **nicotine** stimulate:
   - Lung 1 (anterior hypothalamus) for 2 minutes @ 80 Hz continuous
   - Lung 2 (posterior hypothalamus) for 2 minutes @ 80 Hz continuous
   - Mouth for 30 seconds @ 5 Hz continuous
   - Palate 1 for 30 seconds @ 80 Hz continuous
   - Palate 2 for 30 seconds @ 100+ Hz continuous
   - Point Zero for 30 seconds @ 10Hz continuous
   - Shen Men for 30 seconds @ 10Hz continuous
   - Adrenal Gland for 30 seconds @ 20 Hz continuous
   - Master Sensorial for 30 seconds @ 100+ Hz continuous
   - Master cerebral for 30 seconds @ 100+ Hz continuous
   - Irritability for 30 seconds @ 100+ Hz continuous
   - Corpus Callosum for 30 seconds @ 20 Hz continuous

   For **drugs** stimulate:
   - Lung 1 (anterior hypothalamus) for 2 minutes @ 80 Hz continuous
   - Lung 2 (posterior hypothalamus) for 2 minutes @ 80 Hz continuous
   - Point Zero for 30 seconds @ 10Hz continuous
► Shen Men for 30 seconds @ 10Hz continuous
► Thalamus (Subcortex) for 30 seconds @ 80Hz continuous
► Endocrine for 30 seconds @ 80Hz continuous
► Adrenal Gland 2 for 30 seconds @ 20 Hz continuous
► Master Sensorial for 30 seconds @ 100+ Hz continuous
► Liver for 30 seconds @ 5 Hz continuous
► Kidney 1 for 30 seconds @ 5 Hz continuous
► Kidney 2 for 30 seconds @ 5 Hz continuous
► Brain for 30 seconds @ 80 Hz continuous
► Occiput for 30 seconds @ 10 Hz continuous
► Sexual desire for 30 seconds @ 10 Hz continuous
► Irritability for 30 seconds @ 100+ Hz continuous
► Corpus Callosum for 30 seconds @ 20 Hz continuous

Further on in this course you will find other protocols for treating addictions in the paper written by Dr. Deke Kendall, one of the pre-eminent researchers in the acupuncture profession. His protocols are simpler but also effective.

3. **PAIN CONTROL AND MUSCLE SPASMS:**
   - **Head and neck** – Treat appropriate points @ 2 and 15 Hz mixed for 10-30 minutes
   - **Low back pain** – Treating appropriate points with “Alternating stimulation at 15-Hz and 30-Hz frequencies was more effective than either 4 Hz or 100 Hz in improving outcome measures.”[3] Actually, I think a mix of 2 and 100 Hz is the most effective approach.
   - **Rest of body** – appropriate points @ 2 and 100 Hz mixed for 10-30 minutes

4. **SCALP ACUPUNCTURE** –
   Treat appropriate points @ 3 Hz for 3 minutes continuous

**PART 2**

**CONTRAINDICATIONS FOR ELECTRO-ACUPUNCTURE**[4]

► Do not use with pacemakers (potential cardiac problems)
► Do not apply transcranial stimulation (epileptic possibility with 10-13 Hz)
► Do not apply current across the spine, horizontally
► Do not apply stimulation across the chest region
► Do not apply stimulation over the neck region to prevent laryngospasm
► Profound analgesia induced by E-A puts patients at risk of self-injury
► Do not use with imbedded neural stimulators
► Do not treat 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 oversedate older patients causing risk of falling asleep after treatment. Patient should be driven to and from clinic. [Or caution them in this regard and observe effects from treatment before sending them home]
Excess E-a can produce tolerance by depleting serotonin.
Do not apply to benign and malignant tumors.

PART 3 - RESEARCH BY DR. JI-SHENG HAN, M.D. AND OTHERS- TO BE FOUND AS ATTACHMENTS

ATTACHMENT 1:

Summary - Neurochemical Basis of Acupuncture Analgesia (AA)

ATTACHMENT 2:

a. The Role of 5-HT in AA and Acupuncture Tolerance
b. 5-HT Is an Important Mediator for Both High and Low Frequency Electro-Acupuncture Analgesia (EAA)

ATTACHMENT 3:

a. GABA: Antagonistic Effect on EAA
b. Changes in Opioid Activity in Brain and Pituitary during EAA in the Rat
c. Central 5-HT, Opiate Like Substances (OLS) and AA
d. High and Low Frequency EAA Are Mediated by Different Opioid Peptides
e. Analgesia Produced by Electroacupuncture of Different Frequencies are Mediated by Different Varieties of Opioids in the Spinal Cord
f. New Evidence Supporting Differential Release of Enkephalin and Dynorphin by Low and High Frequency EA Stimulation

ATTACHMENT 4:

Acupuncture: neuropeptide release produced by electrical stimulation of different frequencies by J.S. Han, M.D.

ATTACHMENT 5:

Percutaneous Electrical Nerve Stimulation (P.E.N.S.) for Lower Back Pain by El-sayed Ghoname, M.D. et al.

ATTACHMENT 6:

Treatment of Substance Addiction with Acupuncture by D.E. Kendall, OMD, Ph.D., L.Ac.

ATTACHMENT 7:

The Effect of Stimulus from the Analgesic Response to P.E.N.S. in Patients with Low Back Pain by E. Ghoname, M.D. et al.
FOR WHAT THEY’RE WORTH -  
GLEANINGS FROM AND MUSINGS ON THE RESEARCH OF DR. JI-SHENG HAN:

GABA is an antagonist to both electroacupuncture analgesia (EAA) and to morphine analgesia.\(^5\) Because diazepam facilitates GABA transmission it also results in a marked attenuation of the EAA effect.\(^6\)

Serotonin (5-HT or 5-hydroxytryptamine) augments the effect of electroacupuncture analgesia.\(^7\) Serotonin’s precursor is 5-HTP or 5-hydroxytryptophan, which dramatically increases the effectiveness of electroacupuncture analgesia and reverses tolerance to EAA. Thus it makes sense to advise patients in significant pain to supplement with 5-HTP prior to electroacupuncture or finger acupuncture treatment.

Since about “80 percent of the human body's total serotonin is located in the enterochromaffin cells in the gut”\(^8\), it makes sense to stimulate abdominal points such as K 16; ST 25, 26, & 27; CV 10, 9, 7, 6, 4 for patients with pain.

Electroacupuncture analgesia produces endogenous opiate like substances which act upon the brain at the nuclei accumbens, amygdale, habenula, periaqueductal grey areas,\(^9\) the midbrain, and septum accumbens.

Beta endorphin and ACTH are derived from a common precursor and are co-released from the pituitary under stress.

D-Phenylalanine in rabbits increases the acupuncture analgesia effect of finger acupuncture given to rabbits at the Kunlun point (UB 60) if given 10-15 minutes prior to treatment.\(^10\) D- Phenylalanine is found in breast milk and is available as a nutritional supplement for the treatment of depression and pain. \ L- Phenyllalanine is the artificial sweetener aspartame which has been shown to have neurotoxic effects.

Dynorphin is 6 to 10 times more potent than morphine at producing analgesic effects and is most present in the pituitary, hypothalamus, and spinal cord. Dynorphin’s opioid activity is 50 x more powerful than Beta endorphin, 190 x more powerful than normorphine, and 700 x more powerful than leucineenkephalin.\(^11\) Dynorphins are readily produced with 10 minutes of electroacupuncture stimulation at 15-100 Hz.

To increase the electroacupuncture analgesia effect, raise the intensity from the electronic stimulator every 10 minutes till 30 minutes. Stimulation beyond 30 minutes tends to diminish the EAA effect.

Cerebral norepinephrine (NE) exaggerates the antagonistic effect to EAA.\(^12\)

The effectiveness of EAA is critically dependent upon the time period of administration of the stimulus. After continuous EAA stimulation for 6-8 hours on rabbits, the EAA effect declined and tolerance developed.\(^13\) However, “Tolerance to EAA was reversed by micro-injection of 5-hydroxytryptophan into nuclei accumbens in the rabbit.”\(^14\)
[1] The Neurochemical Basis of Pain Relief by Acupuncture by J.S. Han, Beijing Medical University, 1987, p. 131

[2] Ibid., p. 333


[5] The Neurochemical Basis of Pain Relief by Acupuncture by J.S. Han, Beijing Medical University, 1987, p.161

[6] Ibid. p. 164

[7] Ibid. p.98


[9] Neurochemical Basis of Pain Relief by Acupuncture by J.S. Han, Beijing Medical University, 1987, p.186

[10] Ibid., p. 219


[12] Ibid., p.368

[13] Ibid., p.373

[14] Ibid., p.411