

Evidence of Meridians

Articles evidencing the existence of energy meridians

(Compiled from the internet by Fred Gallo, PhD)

Meridians

In 1950 Yoshio Nakatani demonstrated that in specific organ disease a number of acupuncture points along that organ's acupuncture meridian had a markedly decreased electrical resistance compared with the surrounding skin. (e.g. in Kidney disease several of the kidney points had a lowered skin resistance). He found the resistance values for these points varied with the time of the day, ambient temperature Acupuncture, activity and emotional state of the subject.

In the late 1970's Dr. Robert Becker and associates similarly identified lowered resistance values for over 50% of acupoints along the Large Intestine meridian. Becker suggested that the acupoints acted as amplifiers of a semi conducting Direct Current traveling along the perineural cells which wrap around each and every nerve in the body. This D C system became more negative as it traveled to the ends of fingers and toes and more positive as it returned to the trunk and head (i.e. a Yin - Yang flow).

It was known that the skin acted as a battery (outside of skin is negative and inside was positive) and Becker found the acupuncture point was more positive than the surrounding skin. The insertion of a needle would short circuit this battery and generate a current of injury lasting for several days. Further electrical activity occurred because of:

- (1) ionic reactivity between the metal needle and body fluids
- (2) low frequency pulses of electricity from twirling the needle.

This generated electrical energy would flow along this DC system to the brain and would be analogous to the Qi described by classical acupuncture.

In 1978 Luciani produced Kirlean photographs of the LED (light emission diode) effect of acupoints along the small intestine meridian and the large intestine meridian.

The existence of the meridian system was further established by French researcher Pierre de Vernejoul, who injected radioactive isotopes into the acupoints of humans and tracked their movement with a special gamma imaging camera. The isotopes traveled thirty centimeters along acupuncture meridians within four to six minutes. Vernejoul then challenged his work by injecting isotopes into the blood vessels at random areas of the body rather than into acupoints. The isotopes did not travel in the same manner at all, further indicating that the meridians do indeed comprise a system of separate pathways within the body.

MERIDIANS

Although reports of acupuncture have been recorded in the west since the 1800's, it wasn't until the 1970's that this method of therapy became well publicized. A reporter for the "New York Times" became ill with appendicitis while traveling in China and had an appendectomy without anesthesia, but with the use of acupuncture. This was widely reported in the western press. Doctors tried to explain the technique by saying it was the "placebo affect". This is the phenomenon in which 30% of people will be shown to be able to self heal in experiments when given a sugar pill instead of the "real medicine". However, this was shown to be a false belief because animals (who couldn't possibly respond to suggestion) also responded to the analgesic properties of acupuncture.

In the 1960s, western scientists developed a special tissue-staining technique that allowed him to identify these meridians in rabbits. Western scientist ignored this research until the 1980s when two French researchers, Drs. Claude Darras and Pierre De Vernejoul repeated Dr. Hans experiment using radioactive tracers on human beings.

They injected and then twirled radioactive technetium into the acupoints of patients and used nuclear scanning equipment to follow the flow of technetium. They also injected non-acupoints. At non-acupoints, the radioactive tracer diffused outward from the injection site into circular patterns. When the true acupoints were injected, the radioactive technetium followed the exact pathways as the acupuncture meridians in the ancient charts of the human body! They also found that when acupuncture needles were inserted into distant acupoints along the same tracer-labeled meridians and the twirled, a change was produced in the rate of flow of the technetium through the meridians. This research supported the ancient Chinese claim that the acupuncture needle stimulation affected the flow of ch'i through the body's meridians.

ACUPUNCTURE AND TCM (TRADITIONAL CHINESE MEDICINE)

Early written accounts of TCM date back to 180 B.C. in China and are based on the belief that health is determined by a balanced flow of the vital life energy circulating in all living organisms and is called "qi" (also known as chi-pronounced "chee"). According to acupuncture theory, qi circulates in the body along 12 major energy pathways, or meridians, which are associated with specific internal organs and organ systems. When special needles are inserted (just under the skin) into certain points along these meridians, they help correct and balance the flow of chi. It is believed that acupuncture alleviates pain, increases immune function, and improves a wide variety of conditions by balancing the flow of vital life energy throughout the body.

The presence of these meridians was established by French researcher Pierre de Vernejoul, who injected radioactive isotopes into the acupuncture points of humans and tracked their movement using a special gamma-imaging camera. The isotopes traveled along these meridians within minutes after injection. Vernejoul then challenged his work by injecting isotopes into blood vessels at random points of the body rather than known acupuncture points. In these cases, the isotopes did not travel in the same manner, further indicating that meridians do indeed comprise a system of separate pathways within the body.

The World Health Organization has cited over 100 different ailments for which acupuncture treatment has been shown effective, ranging from chronic pain to migraines, sinusitis, cold, flu, asthma, allergies, addictions, ulcer, gastrointestinal disorders, Meniere's syndrome, stroke, sciatica, osteo-arthritis and many more. There is also evidence to suggest that acupuncture is useful for treating environmentally-induced illnesses, pesticide poisoning, environmentally toxic chemicals/metals and other environmental pollutants.

The Biomedical Basis of Holistic Acupuncture

by Andrew Pacholyk, LMT, MT-BC, CA
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Abstract

In trying to find ways to unite or just bring closer the mysterious transformational techniques of the East to the educationism theories of the West, our Western medical science has tried to organize a logical explanation of how the insertion of tiny acupuncture needles can reduce and even dissolve pain in the human form. This research takes a look at the different approaches the Biosciences have attempted in explaining the way holistic acupuncture works in healing. This research will take a look at the biochemical, biomechanical, as well as bio-electromagnetic theories that have been developed in trying to explain the healing aspects of the Ancient Art of Acupuncture.

The Ancient Art of Acupuncture is the needling of specific points along "meridians" or channels that run throughout our body. Acupuncture can be traced back as far as the Stone Age in China, when stone knives and pointed rocks were used to relieve pain and diseases. "These instruments were known by the ancients as "bian" In the Han Dynasty (206 BC to 220 AD) an Analytical Dictionary of Characters "Shuo Wen Jie Zi" describes the character "bian" as meaning a stone to treat disease."(1) Later these stones were replaced by needles made of bamboo and slivers of animal bone, then finally in the Shang Dynasty bronze casting techniques made metal needles possible, which conducted electricity and Qi. This led to the mapping of the meridian system or channels of energy within the body.

Acupuncture remained relatively unheard of until 1974 when James Reston, a reporter for the New York Times accompanied President Nixon on a trip to China where they witnessed an appendectomy and several demonstrations of serious surgeries being performed with acupuncture as the only anesthetic using Acupuncture Anesthesia. Despite many efforts to prove it's efficiency, Western science has never been able to reconcile how Acupuncture works. They can prove "that" it works, but not "how" it works.

Biochemical theories

Most of the scientific studies of acupuncture have been centered on the analgesic aspects of pain relief. Acupuncture is definitely effective in treating pain; it works 70% to 80% of the time, far greater than the placebo, which only has about 30% efficiency. (2) The problem with attributing all of acupuncture's effects to the placebo effect, which is based on a "suggestive way" or the fact that one just wants to believe that it works, was the fact that veterinarians in China have used acupuncture successfully to treat animals. (3)

Dr. Bruce Promeranz, working at the University of Toronto, was very involved in research done on acupuncture analgesia. By activating small myelinated nerve fibers, acupuncture applications send impulses to the spinal chord, midbrain and pituitary-hypothalamus in the diencephalon. (4) Neurological research done in the late 70's

discovered the naturally occurring chemicals in the body known as endorphins. (5) By binding to the opiate receptors that are found throughout the nervous system, endorphins are able to stop pain. The hypothalamus-pituitary releases Beta-endorphins into the blood and cerebral spinal fluid to create an analgesic effect by causing incoming pain signals from reaching the brain. Pomeranz discovered that pre-treating rats with a drug called Naloxone, a drug known to block the healing endorphins, could not achieve acupuncture pain relief. This finding suggested that endorphin release caused by acupuncture stimulus was an important mechanism behind acupuncture's pain relieving effects.

Pomeranz was then interested in the effects of electrical stimulation and manipulation of acupuncture needles. What he also discovered was the difference between high frequency, low intensity vs. low frequency, high intensity application.

The low frequency, high intensity produced an analgesic effect which was slower at the onset but longer in duration and also having cumulative effects. Therefore, repeated treatments produce more and more benefits for the patient.

The high frequency, low intensity produced a very rapid analgesic effect, which is great for acute pain but shorter in duration with no cumulative effects. (6)

There are presently 100 different neurotransmitters and neuroendocrine substances in the body, of which the endorphins constitute only one class. (7) Hence, there is much work to be done in testing and researching these chemicals and their possible effects with acupuncture.

Biomechanical theories

The biomechanical questions had to do with the presents of meridians in the body. These are the channels in the body, which are filled with our life force, energy Qi. The meridians are said to circulate Qi throughout the system of the body. In an attempt to locate the meridians anatomically, two French Drs. Claude Darras and Pierre De Vernejoul injected human studies with radioactive isotopes into acupuncture points.

A solution of an ionic salt of technetium was injected and followed over a period of time with a gamma ray camera. The radioactive technetium followed the exact same pathways of the meridian channels described and illustrated in several hundred-year-old acupuncture charts of the human body! (8) To ensure that the Drs. were measuring meridians and not blood vessels or lymphatic channels, some patients received technetium injections adjacent to non-acupoint skin regions as well as in nearby blood and lymphatic channels. The radioactive tracers tended to diffuse outward from the injection site into a typical small circular pattern. (9)

In 1975, Dr. Liu YK researched the location of acupoints present at sites of motor nerves.

His work realized that acupoints correspond to regions where motor nerves enter skeletal muscle and where there is a great density of motor nerve terminal elements at the surface. As well, there was found to be dense clusters of encapsulated autonomic nerve mechanoreceptor sites at these points. (10)

Further research was done on Dr. Liu's work. Dr. Watari published a report in Beijing, China in November 1987, based on his work. He found that histologically, volume density of corresponding acupoints to blood vessels are elevated fourfold and that of nerves 1.4 times over that of surrounding tissues. These vessels and fibers mingle to form glomerular structures. (11)

This was exciting new biomechanical evidence in both identifying the meridian channels in the human body and the fact that the acupuncture points on the body have corresponding volume densities that increase with stimulation.

Bio-electromagnetic theories

Science has long been aware of an electrical phenomenon called the "Current of Injury".

This happens when tissue in the body undergoes trauma or microscopic damage to an area of skin. When skin cells are pierced, as with an acupuncture needle, they start leaking electrically charged ions into the surrounding areas of tissue. A weak electrical battery-like charge is created. This electric current is called the current of injury, which is know to stimulate a healing response from the nearby cells. This does not explain how stimulating acupoints with low level, non-invasive lasers could achieve the same therapeutic effects. (12)

The electrical conductivity of acupoints has been known for several decades thanks to the work of Nakatani in the 1950s and by Dr. Robert Becker in the 1970s. Becker's work on the Large Intestine and the Pericardium meridians found that the points along these channels showed significantly more electrical conductivity than areas of skin with non-acupoints.

In 1986 German scientist Fritz-Albert Popp and Chinese biologist, Chang-Lin Zhang developed a model they called the "Standing Wave Superposition Hypothesis". This research attempts to accommodate the holographic nature of acupuncture such as the homunculus or miniature representation of the whole body represented in the ears and the feet. The theory also strives to explain the anomalous skin resistance properties of acupuncture points as well as the apparent interconnectivity between them. (13)

In the Zhang-Popp model, it is shown that the body is composed of sodium, potassium and other electrically charged inorganic ions such as proteins and DNA which when accelerated will emit EM radiation in accordance with conventional physical theory.

With these many types of charges oscillating in the body, an interference pattern is produced formed by the various waves of various wavelengths.

The highest combination of wave amplitudes forms the acupuncture points and meridians by means of constructive interference. At these points the skin is at the highest in electrical conductivity. This conductivity depends on the internal electrical field, which is determined by the interference pattern from the superposition of the numerous waves. (14) Hence, the standing wave pattern of a sick person would have a varied pattern from that of a healthier person. The treatment of acupuncture with needles in the acupoints would cause a disturbance in the standard wave pattern caused by new boundaries formed by the needle. The needle activates the current of injury response resulting in a change in the EM field, producing changes in the biological response, which may promote healing. It is this theory, which implicates the EM fields of the entire body.

The principle of the Connective Tissue Continuum is another approach at viewing the correlation of acupuncture to the bio-electromagnetic theory. From a cellular level through to the bodies' connective tissue, these living organisms are considered a continuum. Not only is the entire cell now known to be mechanically and electrically interconnected in a "solid state" (15), but, all the cells in the body are in turn interconnected to one another via the connective tissues (16).

The function of connective tissues is to keep the body organized, acting as a lace work between the major organs and tissues, to strengthen the wall of arteries, veins, intestines and pathways and to provide fascia and the skeletal structure attachment to the muscles. It is believed that connective tissues may be largely responsible for the rapid intercommunication that enables our body to function effectively as a coherent whole, and is therefore central to our health and well-being. Recent studies with Nuclear Magnetic Resonance has shown that the muscles in living human subjects provide evidence of a "liquid-crystalline-like" structure (17). Liquid crystals usually undergo rapid changes in phases or transitions when exposed to electromagnetic fields. Liquid crystals will also respond to changes in temperature, hydration, pressure and shear forces. Biological liquid crystals carry static electric charges and are influenced by pH, salt concentration and dielectric constant of the solvent.

There are many types of liquid crystals, from the mostly dynamic and liquid, to those which are mostly solid. Those that are mostly liquid can flow as water does, and even though all molecules tend to be aligned in one direction, individual molecules can move very freely and change places with each other while maintaining their common orientation. Nonetheless, the mostly solid crystals have orientation order in three dimensions and also possess a large measure of transitional order. It is already widely recognized that all the major constituents of living organisms may be liquid crystal such as lipids of cellular membranes, DNA, possibly all proteins, especially cytoskeletal proteins, muscle proteins, and proteins in the connective tissues such as collagens and proteoglycans (18). It is through this "liquid network" that scientist believe an acupuncture response is solicited.

In conclusion

By looking at the Bioscience attempts in explaining the way holistic acupuncture works in healing, we are introduced to some very notable concepts. Observing the biochemical view, we see, by Pomeranz research, that the hypothalamus-pituitary releases Beta-endorphins into the blood and cerebral spinal fluid to create an analgesic effect by causing incoming pain signals from reaching the brain. The low frequency, high intensity produced an analgesic effect which was slower at the onset but longer in duration and also having cumulative effects. Therefore, repeated treatments produce more and more benefits for the patient. The high frequency, low intensity produced a very rapid analgesic effect, great for acute pain but, shorter in duration with no cumulative effects.

Biomechanically, Drs. Claude Darras and Pierre De Vernejoul injected human studies with radioactive isotopes into acupuncture points. A solution of an ionic salt of technetium was injected and followed over a period of time with a

gamma ray camera. The radioactive technetium followed the exact same pathways of the meridian channels described and charted in several hundred-year-old acupuncture charts of the human body!

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His work realized that acupoints correspond to regions where motor nerves enter skeletal muscle and where there is a great density of motor nerve terminal elements at the surface.

Bio-electromagnetic theories are based on the Current Of Injury, which is know to stimulate a healing response from the nearby cells. The electrical conductivity of acupoints researched by Nakatani in the 1950s and by Dr. Robert Becker in the 1970s found that the points along the channels showed significantly more electrical conductivity than areas of skin with non-acupoints.

The Zhang-Popp model, shows us that the body is composed of sodium, potassium and other electrically charged inorganic ions such as proteins and DNA which when accelerated will emit EM radiation in accordance with conventional physical theory.

The acupuncture needle activates the current of injury response resulting in a change in the EM field, producing changes in the biological response.

The Connective Tissue Continuum embraces the concept that the cytoskeletal structure of each individual cell in the body is a homunculus of the connective tissue in which it creates. Magnetic Resonance has shown that the muscles in living human subjects provide evidence of a "liquid-crystalline-like" structure. Liquid crystals usually undergo rapid changes in phases or transitions when exposed to electromagnetic fields. It is through this "liquid network" that scientist believe an electromagnetic response from acupuncture is solicited. This research represents much of the current biological views on how acupuncture heals and tries to explain the Biomedical Basis of Holistic Acupuncture.

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Nuclear Medicine and Acupuncture:

A Study on the Migration of Radioactive Tracers after Injection at Acupoints
American Journal of Acupuncture, Vol. 20, No. 3, 1992
Writers: Jean-Claude Darras, Pierre de Vernejoul, and Pierre Albarhde,

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Objective: This paper reports on the authors' investigation of the pathways of acupuncture meridians in the human body through the injection of radioactive tracers (isotopes) at acupuncture points.

Design: The radioactive tracer used was the most common radioactive tracer, technetium-99m (^{99m}Tc), as sodium pertechnetate. The experiment was conducted with a gamma camera, a Siemens SAM (small-area mobile) digital scintillation camera. Image analysis was conducted by a computer system built into the camera. Morphological studies and quantitative dynamic studies were conducted.

The morphological studies consisted of analytical and differential studies. For the analytical studies, the radioactive tracer is injected at a control point located outside any acupoint. Then, another injection is given at an acupoint.

The differential analysis was conducted in order to establish the specific and unique characteristics of the pathways observed in the analytical studies and thus eliminate a vascular or lymphatic explanation. To investigate the vascular pathways, two radiotracers of different energies and therefore discernible by spectrometry were utilised: Technetium-99m was injected as an acupoint and Thallium (²⁰¹Tl) was injected in a small vein situated next to that acupoint. To study the possible relationship between the lymphatic pathways and those demonstrated by the radiotracer, the same dose (20 MBq) and volume (0.05ml) of pertechnetate was simultaneously injected at an acupoint and the first interdigital space of the foot. A quantitative study of the previous data was conducted after selecting two mirror regions of identical shape and size on the leg along the Liver meridian (an acupuncture meridian) and similar "background noise regions" outside the pathways.

Sequential study and stimulation studies were conducted as part of quantitative dynamic studies. The goal of the sequential study was to evaluate the speed of radiotracer migration along preferential pathways. In healthy control subjects and patients with unilateral renal pathology, two sodium pertechnetate injections of identical volume and activity were given simultaneously at the left and right acupoints K-7. In the stimulation study, mechanical, electrical, and thermal stimulation were performed on certain acupoints after the injection of radiotracers to study the migration of the radiotracers.

Laboratory experiments conducted in collaboration with the Cytology Laboratory of the Military Hospital of Percy in Paris tested modifications of granulocyte membrane potentials during stimulation of an acupoint using either a needle or a laser beam. The cell membrane potential was measured with a fluorometric method on blood sampled one minute after the end of injections or stimulation's, and compared with control blood from the same subject.

Setting: The work was conducted on patients from the Department of Urology and from the Acupuncture Department of Biophysics and Nuclear Medicine from the Necker Hospital in Paris. Each experiment was repeated several times.

Patients and Other Participants: The work was conducted on over 250 healthy control subjects and on 80 patients with renal pathology.

Main Outcome Measures: The authors expected to find that the preferential pathways taken by the radiotracers coincide with the acupuncture meridians as described in Chinese traditional medicine and that these pathways are distinguishable from either lymphatic or vascular routes.

Results: Morphological studies found those tracer migrations from acupoints in both healthy and sick patients followed the same identical pathways with those described as "meridians" in Chinese traditional medicine. The results suggest that these pathways are different from vascular and lymphatic pathways.

The quantitative dynamic studies found that in injections at bilateral K-7, there was a faster diffusion on the healthy side, and slower diffusion on the diseased side. In inflammatory organ disease, there was increased migration speed of the radiotracer in the meridian of the related organ. A reduced tracer migration speed is indicative of a degenerative disease, such as cancer. Such findings could be used as the basis of a therapeutic evaluation or diagnosis. The laboratory experiments with cell membranes suggests that acupoint stimulation could be used to provoke constant and reproducible change in cellular physiology.

Conclusion: The migration speed and patterns of a radioactive tracer along pathways which coincide with the Chinese acupuncture meridians show that these routes have neither a vascular nor a lymphatic origin. These pathways are very likely related to the connective tissue diffusion following the neurovascular bundles along the extremities. Findings suggest the hypothesis of the intervention of a neurochemical mechanism in information transmission.

Hi Gary,

Heres some more.

Cheers,

Fred

"A Study on the Migration of Radioactive Tracers after Injection at Acupoints", American Journal of Acupuncture, Vol. 20, No. 3, 1992 by Jean-Claude Darras, Pierre de Vernejoul, and Pierre Albarhde.

I've tried to summarize some of it for ease of digestibility. Notice that all of the subjects showed the same pathways of the kidney meridian after injections at K-7. That's a lot of replication, I would say. I would like to see a study that followed the same procedure and found different results. I would think that this is very unlikely. Their study suggests that the kidney meridian is a reality and that it is actually related to kidney functioning.

Obviously this was a rather detailed and sophisticated study, which involved a total of 330 subjects. The researchers injected radioactive tracers (isotopes) at acupuncture points and a gamma camera was used in conjunction with image analysis by a computer system built into the camera. The radioactive tracer was injected at a control point located outside any acupoint (i.e., sham point) and another injection was made at an acupoint (i.e., Kidney-7 bilaterally). They studied both healthy subjects and those with renal (kidney) pathology, and each experiment was repeated several times.

Morphological studies found those tracer migrations from acupoints in both healthy and sick patients followed the same identical pathways with those described as "meridians" in Chinese traditional medicine. The results suggest that these pathways are different from vascular and lymphatic pathways. The quantitative dynamic studies found that with injections at bilateral K-7, there was a faster diffusion on the healthy side, and slower diffusion on the diseased side. In inflammatory organ disease, there was increased migration speed of the radiotracer in the meridian of the related organ. A reduced tracer migration speed is indicative of a degenerative disease, such as cancer. Such findings could be used as the basis of a therapeutic evaluation or diagnosis. The laboratory experiments with cell membranes suggest that acupoint stimulation could be used to provoke constant and reproducible change in cellular physiology.

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Warmly,

Fred