How does acupuncture work?

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Basics of Acupuncture and Chinese medicine

Acupuncture, along with herbology, exercise, and nutrition, is one of the eight branches of Chinese Medicine. It is believed that this sysyem of medicine is as old as 5000 years. It is an empirical medicine that is based on observed fact and clinical experience that has been continually refined over the years. Much like the Chinese language itself, Chinese medical theory uses metaphorical language to describe body function, processes, and the conditions of disease. The basis of acupuncture is the theory that Qi runs throughout the body in channels or meridians. Qi is most often translated as "energy" or "life force," but in the Chinese language it has a much less mystical connotation. Twelve of the 14 channels are considered to be energetic extensions of the internal organs. Therefore there is a stomach channel, a liver channel, a heart channel and so forth. Disease will arise when there is an imbalance of Qi in the organs and channels. One can also get sick when the Yin and Yang balance is disturbed. Since the ancient Chinese likened the body to the outside environment, bodily disease can also be described in terms of environmental elements such as heat, cold, wind, dampness or dryness. Therefore, an acupuncturist will make a Chinese diagnosis using these metaphorical terms.

East meets West

In the west the metaphorical language of Chinese medicine combined with the use of needles to move an invisible substance called Qi makes it appear to be a very suspect form of medicine. Even with the growing number of Americans who are interested in and willing to try acupuncture, there are still many who believe it is quackary and that it is a medicine in which you need to belive a certain spiritual belief in order for it to work. In reality it is a low risk and clinically effective alternative to allopathic medicine. Patients are turning to acupuncture because, for many illnesses there are not great western medical treatments. For example, the pharmaceuticals may have too many or too severe side effects, or the risk of drugs or surgery is too high, or they are only palliative (symptom relieving), or there are no known effective western treatments, as is the case with Irritable Bowel Syndrome (Carter, 2004).

It is only relatively recently in Chinese medicine's long history that experiments have been conducted to try to help understand the biomechanism behind how acupuncture works. There is still no definitive answer, but many of these studies have produced fascinating results that will open the door to further research. In addition, this new information will help merge the gap between east and west and enable more effective treatment therapies to be available to patients. In this article I will summarize some of the most well known and out standing experiments that have been conducted that offer a beginning explanation.

MRI Evidence

The most definitive study showing that stimulation of acupuncture points have a noticeable effect on the brain was conducted by Cho et al. This well known study supported the idea that effects of acupuncture are mediated through the central nervous system. Using Magnetic Resonance Imaging (MRI) he observed the effects of three acupoints, two known to treat the eye (UB 67 and GB 37) and one known to treat ear disorders (GB 43). "Needling of [UB 67] led to reproducible increases in blood flow, i.e., increased fMRI signals, in Brodmann's areas 17, 18 and 19 of the visual cortex. The effects were comparable to the changes in blood flow in the visual cortex produced by stimulation of the retina with flashing light. Needling of proximal acupoints UB 66 and UB 65 on the same channel also produced visual

cortex activation. In contrast, no visual cortex activity was detectable following needling either nonacupoints on the foot 2-5 cm from the vision related acupoints or acupoint Sp 1 on the large toe which is irrelevant to the treatment of eye disorders. Of considerable interest, needling of GB 37, on a separate meridian but another of the most effective acupoints for the treatment of eye disorders, again produced strong fMRI activity in the visual cortex." They also studied the effects of needling GB 43 which is one of the best known points for treating ear-related disease. They found that needling this point "resulted in strong stimulation of the auditory cortex in a manner similar to direct auditory stimulation with music but also led to weak activation of the visual cortex."

One hypothesis of their's is that the stimulation of the cortical areas by acupuncture enables "the higher centers of the brain to make necessary decisions to regulate activities controlled by the endocrine and autonomic nervous systems. For this to occur, [they] believe that the hypothalamus and the amygdala play a key role, both in mediating the sensory input to the prefrontal cortex by integrating limbic information and in retrieving it from the prefrontal cortex" (Cho et al., cited in Stux and Hammerschlag, 2001).

Opioid receptor involvement in acupuncture analgesia

The first evidence for the involvement of receptors of opioid peptides, including enkephalins, endorphins and dynorphins and endomorphins, in acupuncture analgesia (AA) was from Pomeranz in 1976 and Mayer in 1977. Proof that AA worked via these opioid receptors was that the effects could be abolished with an opioid receptor antagonist, naloxone (Han, JS, cited in Stux and Hammerschlag, 2001).

In a paper by Pomeranz (cited in Stux and Hammerschlag, 2001) he explains one mechanism involved in acupuncture analgesia. "Acupuncture stimulates nerve fibers in the muscle which send impulses to the spinal cord and activate three centers (spinal cord, midbrain, and hypothalamus/pituitary) to cause analgesia. The spinal site uses enkephalins and dynorphins to block incoming messages (of pain). The midbrain uses enkephalins to ... inhibit spinal cord transmission by a synergistic effect of the monoamines, serotonin, and norepinephrine." The hypothalamus/pituitary center induces the release of beta-endorphins and adrenocorticotropic hormone (ACTH) into the blood and CSF to cause analgesia at a distance. Local needles induce spinal site activation while distal needles activate the midbrain and hypothalamus-pituitary.

Tests on rats have shown that those deficient in opiate receptors or genetically lacking endorphin receptors respond poorly to acupuncture. It is for this reason that a percentage of individuals will simply not respond well to acupuncture treatments (Pomeranz, cited in Stux and Hammerschlag, 2001).

In an article by Oleson (cited in Stux and Hammerschlag, 2001), he discussed the use of auricular acupuncture to facilitate withdrawal from narcotic drugs. "Auricular electroacupuncture has been shown to raise levels of met-enkephalin in human narcotic addicts and beta-endorphin in mice withdrawn from morphine." This shows the basis for the effectiveness of the NADA ear acupuncture protocol in drug rehabilitation programs.

Nerve stimulation and acupuncture

In an article by Pomeranz (cited in Stux and Hammerschlag, 2001), he explores the unique anatomical structures at acupoints. Two studies on the locations of acupoints found that points correlate to large nerve bundles or nerve endings. In another study, acupuncture points were found to coincide with trigger points, suggesting that "needles activate sensory nerves which arise in muscles." In a study of trigger points, it was shown "that there are small hypersensitive loci in the myofascial structures which, when touched or probed, give rise to a larger area of pain in an adjacent or distant (referred) area. [It was

also] observed that "dry needling" (with needles containing no drugs) of these trigger points produced pain relief."

Oleson (cited in Stux and Hammerschlag, 2001) reviews some studies using auricular acupuncture for weight loss. One article found that "auricular acupuncture was theorized to suppress appetite by stimulating the auricular branch of the vagus nerve and raising serotonin levels, both of which increase smooth muscle tone in the gastric wall." In another study that stimulated auricular points on rats associated with the gi tract, results showed that electrical stimulation of these points stimulated the satiety center in the ventromedial hypothalamus (VMH) but not the lateral hypothalamic feeding center (LH). After 16 days the body weight of rats were significantly reduced as compared to control group rats. There were behavioral changes in food intake. "These results indicate a compelling connection between auricular acupuncture and a part of the brain associated with neurophysiological regulation of feeding behavior."

Oleson also reviewed the various studies assessing the changes in neural response related to pain. One study showed that electrical stimulation of auricular points on rats produced an elevation in the threshold of hot plates which was reversed by naloxone (mentioned earlier). Another provided empirical support for the role of the thalamus by showing that acupuncture impulses are thought to inhibit pain perceptive pathways. Various other studies showed the elevation of pain thresholds with the stimulation of LI 4 and found that enkephalin receptor numbers increased in part of the brain in rats.

"In recent years, more and more laboratory proof has accumulated that acupuncture can change the charge and potential of neurons, the concentrations of K(+), Na(+), Ca(++) and the content of neurotransmitters such as aspartate, and taurine and the quantities of neuro-peptides such as beta-endorphin and leu-enkephalin. All these phenomena are directly related to nerve cells" (Fu, 2000).

Relationship of acupuncture points and low skin resistance

Numerous researchers have observed that acupuncture points have higher levels of skin conductance or lower levels of skin resistance than surrounding skin surfaces. In addition, meridian acupuncture points exhibit even lower electrical resistance when there is pathology in the organ they represent. Also, the normal, bilateral symmetry of the electrical resistance of acupuncture points is disturbed when there is unilateral pathology in the body. One study plotted 68 healthy adult bodies for low skin resistance points and found that the "low skin impedance points" were predominantly distributed along the 14 acupuncture meridians. 64% of them were exactly on meridians while 83.3% were located within 3 mm of a channel. In another study, concentrations of substance P were significantly higher at acupoints with low skin resistance than at non acupuncture points. "Substance P plays a role in pain transmission as well as stimulating contractility of autonomic smooth muscle, inducing subcutaneous liberation of histamine, causing peripheral vasodilation, and leading to hypersensitivity of sensory neurons." This could be the reason for points being electrically active and tender to palpation (Oleson, cited in Stux and Hammerschlag, 2001).

According to Shang (cited in Stux and Hammerschlag, 2001), "the high skin conductance of the meridian system is further supported by the finding of a high density of gap junctions at the site of acupuncture points. Gap junctions are hexagonal proteins complexes that form channels between adjacent cells. It is well established in cell biology that gap junctions facilitate intercellular communication and increase electric conductivity."

Oleson reports that, in a study using auricular diagnosis, 40 patients with muscular skeletal problems had their ears examined and numerically rated tenderness of various points palpated with a probe. The patients were completely covered up with only their ear exposed. "There was a positive

correspondence between auricular points identified as reactive, both tender to palpation and exhibiting at least 50 μA of electrical conductivity, and the parts of the body where there was muscular skeletal pain. The statistically significant overall correct detection rate was 75.2%." A similarly conclusive study was conducted that examined reactive auricular points related to heart disorders (Oleson, cited in Stux and Hammerschlag, 2001).

Other findings

Oleson (cited in Stux and Hammerschlag, 2001) reports that one study found that stimulation of ear seeds on ear points liver, lung, san jiao, endocrine and thalamus (subcortex) significantly lowered levels of lactic acid obtained after physical exercise. They speculate that this was perhaps due to peripheral blood circulation.

Oleson also cites a study that examined changes in plasma adrenocorticotropic hormone (ACTH) and growth hormone levels after electrical stimulation of the adrenal point on the ear.

Shang (cited in Stux and Hammerschlag, 2001) reports that acupuncture and meridian points have also been found to have higher temperature, metabolic rates, and carbon dioxide release.

"The existence of the meridian system was further established by French researcher Vernejoul, who injected radioactive isotopes into the acupoints of humans and tracked their movement with a special gamma imaging camera. The isotopes travelled thirty centimeters along acupuncture points within four to six minutes" (Carter, 2004).

In a 1997 statement by the National Institutes of Health (NIH), it was stated that "there is also evidence of alterations in immune functions produced by acupuncture." In addition, one of the studies cited by the NIH using SPECT (single photon emission computed tomography) imaging showed increased blood flow to the thalamus, the area of the brain that relays pain and other sensory messages, after acupuncture needles were inserted.

Lastly, acupuncture has been shown to be effective in animals, such as dogs suffering from hind-limb paralysis (Sumano et al., 2000). This can help to prove that acupuncture works beyond the placebo effect, since animals are not suggestible and therefore not prone to be affected by a placebo.

The World Health Organization (WHO)

The many clinical trials testing the effectiveness of acupuncture for various diseases has been ongoing. The World Health Organization published a report on controlled clinical trials and compiled a list of conditions for which acupuncture has demonstrated effectiveness. An excerpt of the document can be found attached.

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The following is an excerpt from an official WHO document entitled "Acupuncture: Review and Analysis of Reports on Controlled Clinical Trials." Compiled by John A. Amaro D.C., FIAMA, Dipl.Ac, L.Ac.
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Diseases and disorders that can be treated with acupuncture

The diseases or disorders for which acupuncture therapy has been tested in controlled clinical trials reported in the recent literature can be classified into four categories as shown below.

Diseases, symptoms or conditions for which acupuncture has been proved—through controlled trials—to be an effective treatment:

Adverse reactions to radiotherapy and/or chemotherapy
Allergic rhinitis (including hay fever)
Biliary colic
Depression (including depressive neurosis and depression following stroke)
Dysentery, acute bacillary
Dysmenorrhoea, primary
Epigastralgia, acute (in peptic ulcer, acute and chronic gastritis, and gastrospasm)
Facial pain (including craniomandibular disorders)
Headache
Hypertension, essential
Hypotension, primary
Induction of labour
Knee pain
Leukopenia
Low back pain
Malposition of fetus, correction of
Morning sickness
Nausea and vomiting
Neck pain
Pain in dentistry (including dental pain and temporomandibular dysfunction)
Periarthritis of shoulder
Postoperative pain
Renal colic
Rheumatoid arthritis
Sciatica
Sprain
Stroke
Tennis elbow

Diseases, symptoms or conditions for which the therapeutic effect of acupuncture has been shown but for which further proof is needed:

Abdominal pain (in acute gastroenteritis or due to gastrointestinal spasm)
Acne vulgaris
Alcohol dependence and detoxification
Bell's palsy

Bronchial asthma
Cancer pain
Cardiac neurosis
Cholecystitis, chronic, with acute exacerbation
Cholelithiasis
Competition stress syndrome
Craniocerebral injury, closed
Diabetes mellitus, non-insulin-dependent
Earache
Epidemic haemorrhagic fever
Epistaxis, simple (without generalized or local disease)
Eye pain due to subconjunctival injection
Female infertility
Facial spasm
Female urethral syndrome
Fibromyalgia and fasciitis
Gastrokinetic disturbance
Gouty arthritis
Hepatitis B virus carrier status
Herpes zoster (human (alpha) herpesvirus 3)
Hyperlipaemia
Hypo-ovarianism
Insomnia
Labour pain
Lactation, deficiency
Male sexual dysfunction, non-organic
Ménière disease
Neuralgia, post-herpetic
Neurodermatitis
Obesity
Opium, cocaine and heroin dependence
Osteoarthritis
Pain due to endoscopic examination
Pain in thromboangiitis obliterans
Polycystic ovary syndrome (Stein–Leventhal syndrome)
Postextubation in children
Postoperative convalescence
Premenstrual syndrome
Prostatitis, chronic
Pruritus
Radicular and pseudoradicular pain syndrome
Raynaud syndrome, primary
Recurrent lower urinary-tract infection
Reflex sympathetic dystrophy
Retention of urine, traumatic
Schizophrenia
Sialism, drug-induced
Sjögren syndrome
Sore throat (including tonsillitis)
Spine pain, acute
Stiff neck
Temporomandibular joint dysfunction

Tietze syndrome
Tobacco dependence
Tourette syndrome
Ulcerative colitis, chronic
Urolithiasis
Vascular dementia
Whooping cough (pertussis)

Diseases, symptoms or conditions for which there are only individual controlled trials reporting some therapeutic effects, but for which acupuncture is worth trying because treatment by conventional and other therapies is difficult:

Chloasma
Choroidopathy, central serous
Colour blindness
Deafness
Hypophrenia
Irritable colon syndrome
Neuropathic bladder in spinal cord injury
Pulmonary heart disease, chronic
Small airway obstruction

Diseases, symptoms or conditions for which acupuncture may be tried provided the practitioner has special modern medical knowledge and adequate monitoring equipment:

Breathlessness in chronic obstructive pulmonary disease
Coma
Convulsions in infants
Coronary heart disease (angina pectoris)
Diarrhoea in infants and young children
Encephalitis, viral, in children, late stage
Paralysis, progressive bulbar and pseudobulbar