Neuroanatomical Acupuncture[1]

Thousands of veterinarians worldwide practice acupuncture, a medical treatment approach that involves the insertion of thin, sterile needles into precise locations in order to stimulate reparative processes (see figure 1).

Figure 1: Acupuncture Needle Insertion

Every year, hundreds more veterinarians learn this technique in order to help animals heal more rapidly and to minimize the use of drugs and surgery when possible and appropriate. Frequently treated conditions include arthritis, hip dysplasia, gastrointestinal conditions, skin problems, peripheral and central nervous system disorders, and more. [2] Steadily growing client demand demonstrates that acupuncture serves an important role in veterinary medicine, though much investigation remains to be done to study the effects of acupuncture across species and medical conditions.

However, acupuncture continues to be viewed with skepticism by some. They find implausible the ideas that disease results from blockages of invisible energy (Qi) as it courses along unseen meridians. These ideas are also facing serious challenges from acupuncture practitioners and educators. Medical scholars such as Deke Kendall, OMD, PhD, have provided compelling evidence that the development of the energy-meridian ideas were recent events, and not part of the ancient Chinese notions of acupuncture.[3] According to Dr. Kendall, the energy-meridian theory arose via a mistranslation of Chinese terminology into French in the 1930s by Georges Soulie de Morant, who promoted the idea that Chinese medicine did not require an understanding of physiology and anatomy. In contrast, historical evidence reveals that the ancient Chinese physicians knew that acupuncture was physiologically based, affecting blood and vital air (breath) circulation as well as nerve function. Given these historical details, and whereas

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[1] The contents of this paper originally appeared in the February 2002 issue of *Veterinary Practice News.*

[2] Altman, S. in Schoen A. and Wynn S. (eds.): *Complementary and Alternative Veterinary Medicine – Principles and Practice.* St. Louis: Mosby, Inc., 1998, p. 159.

[3] Kendall DE. Presented in a lecture entitled “The History of Chinese Medicine” given during the Colorado State University Veterinary Medical Acupuncture Training Program in October 2001, Fort Collins, CO.

the scientific study of acupuncture in the United States has now entered its fourth decade, it appears imperative to include within the study of acupuncture a biomedical perspective, and to describe its characteristics and influences in anatomic and physiologic terms.

Neuroanatomic acupuncture correlates traditionally described points and channels with neurologic pathways and influences as understood today. In the 1980's, investigators related the effects of acupuncture to the stimulation of at least ten neural structures. [4] Evidence also shows that complete denervation obliterates the effects of acupuncture. [5] Brain mapping techniques such as functional magnetic resonance imaging (fMRI) reveal correlations between acupuncture point stimulation and cortical activation.[6] [7] That is, treatment effects in certain diseases appear to correspond to cortical activation of affected organs and tissues.[8] [9]

Neuroanatomic acupuncture involves selection of points that relate neurologically or physiologically to the dysfunctional area(s). Some acupuncture points overlie the brain, and many occur near cranial, peripheral, and autonomic nerves and nerve plexi, as described below.[10]

- **Cranial nerves:** On the face, the trigeminal (C.N. V) and the facial (C.N. VII) nerves are readily stimulated with acupuncture. Acupuncture points relating to cranial nerves may occur either where the nerve trunk exits the cranial foramen or at the endpoint of its terminal branch. Acupuncture points may also be located at locations where two different nerves meet, or where nerves branch bilaterally.
- **Peripheral nerves:** On the thoracic and pelvic limbs, acupuncture points that relate to peripheral nerves may occur at either supracondylar or infracondylar locations. They may also lie in interosseous grooves, such as between the radius and ulna or between the tibia and fibula.
- **Spinal nerve roots:** From the neck to the tail, acupuncture points occur near the dorsal primary ramus at almost every spinal segment.
- **Motor endplate zones within muscles:** Many acupuncture points can be found at the site where a nerve enters the muscle it innervates, near

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[4] Dung HC. Anatomical features contributing to the formation of acupuncture points. *Am J of Acup.* 1984; 12:139-143.
[5] Bossy J. Morphological data concerning the acupuncture points and channel network. *Acup & Electro-Ther Res, Int J.* 1984; 9:79-106.
[6] Yoshida T et al. Non-invasive measurement of brain activity using functional MRI: toward the study of brain response to acupuncture stimulation. *Am J of Chin Med.* 1995; 23:319-325.
[7] Shen J and Hommer DW. Functional neuroimaging: review of methods and applications to acupuncture research. *Clinical Acupuncture and Oriental Medicine.* 2001; 2:163-167.
[8] Cho ZH et al. *Neuro-Acupuncture. Volume 1, The Basics.* Los Angeles: Q-Puncture, 2001, p. 7.
[9] Cho ZH et al. New findings of the correlation between acupoints and corresponding brain cortices using functional MRI. *Proc. Natl. Acad. Sci. USA*. 1998; 95:2670-2673.
[10] Wong J and Cheng R. *The Science of Acupuncture Therapy,* 2nd Edition. Toronto: Richard S. S. Cheng, 1987, pp. 35-6.

the endplate zone of motor nerve endings. These sites relate to trigger points, which are tender when pressed and can cause intense pain that radiates to distant locations.

- **Autonomic pathways:** More remains to be elucidated about the mechanism of action by which acupuncture regulates autonomic function. Along the extremities, arteries follow peripheral nerves closely, but when they reach the hand or foot in humans, they form double arches. Morphologic examination of acupuncture points reveals that some of the most influential points that affect sympathetic regulation reside near these terminal arterial structures. These are powerful sites where significant effects on the regional vascular system or systemic vascular system can arise through acupuncture stimulation. Several points overlie sympathetic ganglia in the cervical region, and are also capable of widespread influence. Investigation of anatomic correlates between species is necessary in order to provide satisfactory transpositional point locations in non-human animals that satisfy the neuroanatomic relationships described above.

Neuroanatomic acupuncture lends itself particularly well to the treatment of pain and neurologic impairment by restoring and rebalancing neural regulation in order to optimize endogenous pain control, reduce inflammation, and resolve somatic dysfunction. This technique involves selecting points that modify several sources of pain input, including spinal, peripheral, and autonomic nerve structures. Spinal and peripheral nerves provide sensorimotor input to the painful area; autonomic contributions to the region can aggravate pain and perpetuate chronic pain. From a neuroanatomic acupuncture perspective, it is more appropriate to select points that are anatomically relevant to the pathology than to try to adhere to classically described treatment protocols, or “recipes”.

In addition to treating pain and neuromusculoskeletal impairments, acupuncture can influence visceral function via spinal segmental interneuronal activation. Points located longitudinally in paraspinal regions (along the Bladder meridian, or Foot Tai Yang channel) stimulate the dorsal primary rami of the spinal nerve roots, which then affect associated spinal cord segments that also carry visceral information. Somatic and visceral inputs converge via common interneurons, such that stimulation of the structures along the back appears to affect internal organ function.[11][17] Non-surgical conditions such as colic in horses can be treated effectively by stimulating points along the back that restore balanced nerve transmission to the intestines through these somatovisceral pathways.

[11] Patterson MM and Wurster RD. Chapter 10: Neurophysiologic System: Integration and Disintegration. In Ward RC: *Foundations for Osteopathic Medicine.* Williams and Wilkins, Baltimore, MD. 1997, pp. 136-151.

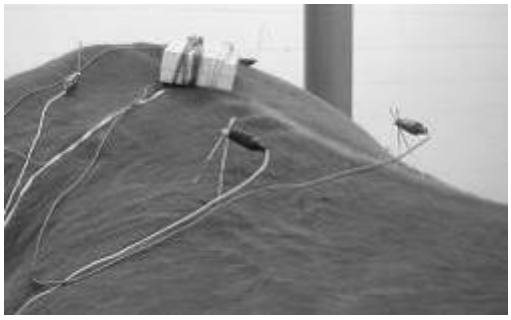

Figure 2, Electrical Stimulation of Back Points to Treat Non-surgical Colic in a Horse

Another approach involving neuroanatomical acupuncture applied in a spinal segmental fashion is termed "PENS", or percutaneous electrical nerve stimulation. A particular application of PENS for the treatment of pain was developed by William Craig, MD (hence the term "CraigPENS). CraigPENS involves the stimulation of peripheral nerves, nerve roots, and the autonomic system in accordance with the myotomal, sclerotomal, and dermatomal distribution of pain experienced by the patient. CraigPENS works primarily by stimulating the endogenous opioid system, and can often create dramatic shifts in patients' pain patterns. Controlled clinical trials conducted by Drs. Craig and White at UT Southwestern Medical School have validated the efficacy of CraigPENS in a number of pain syndromes. These include pain from bony metastasis,[12] low back pain,[13] sciatica,[14] diabetic neuropathy,[15] headache,[16] and herpes zoster.[17]

Admittedly, extrapolating from the human medical research arena to the veterinary field must be done cautiously. Research at Colorado State University is currently underway to systematically evaluate the effects of acupuncture in veterinary patients. The call for more, rigorous, well-controlled studies underscores the need for competency-based acupuncture training programs that not only teach treatment skills, but that also encourage graduates to think

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[12] Ahmed HE et al. Percutaneous electrical nerve stimulation (PENS): a complementary therapy for the management of pain secondary to bony metastasis. *Clinical Journal of Pain.* 1998; 14:320-323.

[13] Ghoname EA. The effect of stimulus frequency on the analgesic response to percutaneous electrical nerve stimulation in patients with chronic low back pain. *Anesth Analg.* 1999; 88:841-846.

[14] Ghoname EA et al. Percutaneous electrical nerve stimulation: an alternative to TENS in the management of sciatica. *Pain.* 1999; 83:193-199.

[15] Hamzzza MA et al. Percutaneous electrical nerve stimulation: a novel analgesic therapy for diabetic neruopathic pain. *Diabetes Care.* 2000; 23(3):365-370.

[16] Ahmed HE et al. Use of percutaneous electrical nerve stimulation (PENS) in the short-term management of headache. *Headache.* 2000; 40:311-315.

[17] Ahmed HE et al. Percutaneous electrical nerve stimulation: an alternative to antiviral drugs for acute herpes zoster. *Anesth Analg.* 1998; 87:911-914.

critically. Medical acupuncture courses of this type will help to integrate acupuncture into conventional veterinary health care, bringing pain relief and restoration of function for an even larger population of veterinary patients.