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Traditional Chinese Veterinary Medicine: The Mechanism and Management of Acupuncture for Chronic Pain

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Complementary and alternative medicine can be defined as the diagnosis, treatment, and/or prevention that complements mainstream medicine, satisfying a demand not met by orthodoxy and diversifying the conceptual framework of medicine. Acupuncture is being used much more commonly now as a sole or integrative modality in veterinary medicine and can play a large role in management of inflammation and chronic pain. Western medical etiology, pathophysiology, diagnosis, and treatment should be considered before applying acupuncture. This article describes the evolving biomedical basis of acupuncture analgesia and gives the practitioner an overview of how acupuncture can be performed in a medical setting.

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Complementary and alternative medicine can be defined as the diagnosis, treatment, and/or prevention that complements mainstream medicine, satisfying a demand not met by orthodoxy and diversifying the conceptual framework of medicine.¹ Acupuncture is being used much more commonly now as a sole or integrative modality in veterinary medicine and can play a large role in management of inflammation and chronic pain. Western medical etiology, pathophysiology, diagnosis, and treatment should be considered before applying acupuncture. This article describes the evolving biomedical basis of acupuncture analgesia and gives the practitioner an overview of how acupuncture can be performed in a medical setting.

Acupuncture originated in China and is part of traditional oriental medicine. In the animal field, it is a modality within Traditional Chinese Veterinary Medicine (TCVM). Its precise origin is still the subject of debate and was documented thousands of years ago. This medicine uses a metaphoric language to describe the pathophysiology of disease and patterns of treatment. The traditional concept surrounds *qi* (pronounced chee), which is usually translated as energy or life force. The *qi* circulates through all parts of the body via pathways called meridians. Up to 350 points along and around these meridians have increased bioactivity and are called acupuncture points. TCVM practitioners discern patterns of diagnosis, which allow for whole-animal identification of dysfunction, dysregulation, and depletion manifest in the individual, guiding treatment and providing prognostic

information. Diagnosis is attained through evaluation of multiple parameters including history, physical examination, behavior, and environmental interaction. Point selection is individualized based on TCVM principles. Acupuncture can still be applied from a biomedical approach, although the practitioners espousing TCVM principles value the philosophies for providing more effective results. In order for Traditional Chinese Medicine and acupuncture to become more integrated into medical practice, conceptual and practical differences between western and Chinese medicine must eventually be addressed. Research is rapidly growing in this field. Many functions of acupuncture point stimulation are being defined, and both human and veterinary clinical trials are ongoing to bring this area of treatment further into the realm of evidence-based medicine.

Recent clinical veterinary studies demonstrate effectiveness in many areas. A case report describes significant improvement in a dog with Horner's syndrome.² Another case report discusses return to function in a cat with multifocal disc disease.³ A study somewhat astounding to the Western practitioner describes electroacupuncture as the sole analgesic needed for bovine surgery.⁴ Acupuncture with gold wire implants can diminish the severity of epilepsy in dogs.⁵ Acupuncture treatment is equivocally significant when applied adjunctively postsurgery to dogs undergoing hemilaminectomy.⁶ Shorter time to ambulation and deep pain perception occurs in dogs with thoracolumbar intervertebral disc disease when western treatment is combined with electroacupuncture.⁷ When addressing thermal and mechanical nociceptive stimuli, bilateral stimulation of acupuncture points induces a shorter latency period, greater intensity, and longer duration of analgesia in dogs.⁸ Not all of these studies address pain, but the importance of clinical studies or even case reports is to begin to characterize acupuncture as a medical treatment in our conventional world.

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Acupuncture Point Physiology

Anatomically, most points are located in palpable depressions. Points are located at areas of low electrical resistance and high electrical skin conductance. Point finders exist, though they are made for humans and tend not to be reliable in animals. The areas of increased bioactivity tend to occur at nerve bifurcations or where nerves penetrate tissue planes. Motor points (type I) are the most common and exist where nerves enter muscles. Type II points are located where nerves intersect on the dorsal and ventral midlines of the body. Type III points are located at the branching of superficial nerves. Type IV points are located at the Golgi tendon organs where nerves penetrate tendons.⁹ Histologically, points are accumulations of neurovascular bundles: free nerve endings, small arterioles, veins, lymphatics, and an increased concentration of mast cells.¹⁰ Stimulation of a point incurs tissue damage, the inflammatory cascade, histamine release, and specific neural excitation.

Mechanism of Action

Acupuncture inhibits nociceptive transmission,¹¹ improves blood flow, inhibits inflammation, reduces muscle tension and spasm, resets proprioceptive mechanisms and structural posture, and affects the autonomic nervous system. The mechanism of acupuncture analgesia has been widely explored since the 1970s. The TCVM actions are explained in large part by neurohumoral action followed by immunomodulatory effects on somatic and visceral fields. The cascade of events neurophysiologically seems to be mediated by endorphins and monoamines at the level of local, segmental, and suprasegmental areas. Percutaneous stimulation stimulates A-beta sensory fibers to cause reflex reactions to motoneuron tone, vasculature, and ligaments at the segmental level. A-beta afferent stimulation also contributes to local inhibition of nociception through the gate theory.¹² C and A-delta nociceptive fibers are stimulated, but transmission does not readily follow because of inhibition by endogenous opioids, inhibitory interneurons, propriospinal processes and descending norepinephrine, and serotonergic pathways.¹³ Endorphin release occurs but is only one component of the changes that must take place to cause nociceptive inhibition. The central nervous system biochemistry triggers a series of events involving complex interactions of the endogenous opioids with substance P, acetylcholine, serotonin, norepinephrine, gamma-amino butyric acid (GABA), and other neurotransmitters.¹⁴

Recent work has looked at the effect of acupuncture in hyperalgesic and neuropathic animals.¹⁵ Acupuncture can affect the phenomena pivotal to the development or control of neuropathic pain. Central sensitization is the process of windup, and resulting transcriptional changes in the dorsal horn neurons lead to altered synaptic neurotransmitter levels and number or receptors.¹⁶ Central disinhibition is an imbalance between the excitatory and inhibitory side of the nervous system.¹⁷ Recruitment of mechanoreceptive sensory fi-

bers to produce substance P so that input from them is perceived as pain¹⁸ is another mechanism of sensitization and plasticity. Acupuncture has been shown to affect all components and consistently minimizes or prevents neuropathic pain in animal models.¹³

More attention is being directed toward the antiinflammatory effect of acupuncture. Many studies are evaluating effects on individual factors including lymphocytes, cytokines, and endogenous opioids. T- and B-cell activity has been shown to be decreased with electroacupuncture in arthritic mice.¹⁹ Leukocyte migration and activity can be affected, and many of these changes are controlled through humoral means.²⁰ The literature is filled with studies demonstrating cytokine changes in many disease states, and with varied acupoint stimulation. The antiinflammatory activity of acupuncture is stimulated by both endogenous opioid and non-opioid means.

Some studies suggest that acupuncture significantly affects the autonomic nervous system.^{21,22} Electroacupuncture stimulation has been shown to activate the sympathetic nervous system, thereby suppressing iatrogenically induced leukocyte migration. Adrenal gland activity and the sympatho-adrenal medullary axis is necessary for high-frequency acupuncture antiinflammatory action and thermal hyperalgesia control in long-term neuropathic pain. Blockade of the peripheral sympathetic postganglionic neurons with propranolol (a beta-adrenoreceptor antagonist) also blocks the antiinflammatory effect of low-frequency acupuncture,²³ demonstrating one mechanism for electroacupuncture antiinflammatory activity. There is evidence that acupuncture is useful as an adjunctive treatment for sympathetically mediated pain in people,²⁴ and so it may be effective in complex regional pain states such as that found with syringomyelia.

The effects of acupuncture cannot be explained by a single mechanism. The local event is initiated in the nervous system and spreads to the endocrine and immune system. Regardless of the mechanism, the question remains as to whether, clinically, the data support effectiveness, and whether the right questions are being asked to produce illustrative data. Evidence-based medicine is the integration of the best research evidence with clinical expertise and patient needs.²⁵ Research in this field has yet to catch up with clinical wisdom.

Modes of Therapy

Several methods of stimulation of acupuncture points can be used. Each traditionally holds a different purpose. The following are a few of the more common methods of veterinary acupuncture. The reader is referred to veterinary acupuncture textbooks for more comprehensive descriptions.²⁶

Dry Needle

The most common veterinary application is to apply needles alone to acupuncture points. See [Figure 1](#). A subsequent response such as strong sensation, local hyperemia, or sudden sedation signifies that the point is found. This is called



Figure 1. Dry needle acupuncture in a weak dog with lumbosacral dysfunction, previous head trauma and cognitive depression, and a thoracic tumor. This dog made significant improvement in ambulation with the first session of acupuncture. (Color version of figure is available online.)

de-qi (pronounced daychee). The angle and depth of insertion vary with the anatomical location, age, size, and health of the patient. Tonifying or diminishing physiologic states can be done by moving needles with gentle or forceful thrust and twisting in clockwise or counterclockwise directions. Duration of needle stimulation is commensurate with the needs of the animal.

Aqua-acupuncture

Often, fluid is injected into the acupuncture points to prolong the effect of point stimulation. Practitioners will use various substances from saline solution²⁷ to vitamin B12 to Adequan. Injection into acupuncture points is able to be done quickly, often when the animal does not tolerate the length of time needed to keep needles placed or to apply electroacupuncture. Injectables can also be used to potentiate the effect of the agent itself. Bee venom at acupuncture point ST36 potentiates analgesia in neuropathic pain states in rodent models²⁸ and is used in some TCVM practices. Autologous blood is used in acupuncture points for an antiinflammatory effect.²⁹ Pharmacopuncture is a process whereby drugs are injected into acupuncture points in much smaller doses than normally used, but with an aim for an equipotent effect. Luna and colleagues have demonstrated subclinical doses of acepromazine to be effective in both dogs and horses when injected into specific points.³⁰

Laser Acupuncture

Laser-emitting diode devices can be used to stimulate acupuncture points. Using low-power (5-30 mW) energy of wavelengths 630 to 960 nm is common in veterinary medicine. Laser has been shown to be analgesic and antiinflammatory.^{31,32} Laser light refracts within 15 mm in living tissue. It is therefore useful in shallow acupuncture points or in areas of thin integument. More powerful lasers are being devel-

oped and may become much more useful in veterinary acupuncture.

Material Implantation

Acupuncture points can be stimulated over a long duration by using various materials from surgical suture, to skin staples, to gold beads or wire. The most common technique in modern countries is to implant gold bits periarticularly in animals with hip dysplasia or degenerative joint disease. This has also been successfully shown to diminish severity of epilepsy in dogs.⁵ The mechanism of action is thought to be antiinflammatory, in part. Cyanide released from inflammatory cells complexes with gold to create aurocyanide. This ion inhibits lysosomal enzymes from inflammatory cells, decreases the numbers of inflammatory cells, and inhibits antigen processing. Nuclear factor-kappa B-binding activity and interleukin-kappa B kinase activation is suppressed, reducing the production of proinflammatory cytokines.³³ Gold bead implantation is used clinically by TCVM practitioners with success in diminishing pain and increasing ambulation.³⁴ There is variable information in the recent literature, however, so appropriate cases must be chosen carefully.³⁵⁻³⁸

Electroacupuncture

Applying electrical stimulus to peripheral nerves through percutaneously placed needles can produce prolonged analgesia lasting from hours to days or longer. This form of acupuncture is commonly applied to animals. See Figure 2. Stimulation of the sensory afferent fibers will cause transient



Figure 2. Electroacupuncture being performed on a cat with hind leg paralysis after radiosurgery for a fibrosarcoma, and with signs of neuropathia such as sudden looking at hind legs and occasional barbering of hair over hip area. This cat improved strength and use of hindlegs after 3 sessions of electroacupuncture. (Color version of figure is available online.)



Figure 3. Postsurgical treatment of a dog with chronic hip pain. The acupuncture sites were determined based on muscle soreness, inflammation, osteoarthritis, and trigger points. The dog was in good spirits and had to be restrained from walking on recovery from anesthesia compared with dogs with similar surgeries that did not receive acupuncture. (Color version of figure is available online.)

analgesia through the gate theory of inhibition, but the longer-lasting analgesia is a function of stimulation of the A-delta and C fibers.³⁹ Quite frequently, the veterinary acupuncturist will see chronic pain states that resolve after only a few treatments. The underlying mechanism of long-term synaptic alterations is still unclear, but the NMDA receptor is involved as expected. An interesting point is that low-frequency stimulation (2 Hz) and subsequent diminishment of neuropathic pain are generally known to release endorphins, but also depend on NMDA receptor stimulation to depress C-fiber-evoked potentials of the dorsal horn.^{40,41} This is counter to the widely held belief that the NMDA receptor must be antagonized in the resolution of chronic pain. Possibly, the activity of this receptor plays a role in modulation of neurotransmission through depression as well as potentiation. Higher frequencies such as 100 Hz seem to be dependent on GABAergic and serotonergic inhibitory pathways, and are less effective in diminishing neuropathic pain than the lower frequencies.⁴⁰ Electric frequencies are usually set anywhere from 1 Hz to 200 Hz, and the millivoltage is set such that the animal barely notices the stimulation.

Contraindications and Precautions

Needle placement through infected or inflamed skin should be avoided. If severe clotting abnormalities exist, needles may exacerbate potential for bleeding. Acupuncture should not be applied around the abdomen of a pregnant animal or in specific points that may contribute to premature parturition. Acupuncture, and especially electroacupuncture, should not be applied through, around, or across tumor sites. Electroacupuncture should not be applied across the thorax area in

animals with pacemakers. Needles should not be placed at or near sites of fractures or acute trauma. Also, keep in mind that fractious animals are sometimes difficult to safely treat, and improperly placed needles may incur tissue trauma such as muscle spasm around bent needles, organ puncture, or nerve and blood vessel laceration. Broken needles are rare, but could migrate through tissue causing harm. Adverse events due to acupuncture are very uncommon.⁴²

Treatment

A typical session consists of an examination using conventional diagnostics, or a TCVM approach to determine a pattern diagnosis. Once a diagnosis has been made, acupuncture points may be stimulated by needles, laser, pressure, ultrasound, heating, or substance injection. If needles are used, they are inserted into a number of points on a quietly held animal. Most animals are quite receptive to the needles, though occasionally an animal needs to be muzzled or sedated. Many animals become quite peaceful and relaxed once the needles are in place. Even cats will tolerate acupuncture. The needles are usually 28- to 34-gauge and are inserted into tissue just under the skin or deeper into muscle. They are left in for 20 to 30 minutes at a time. Electroacupuncture with application of low levels of electrical stimulation to the needles is commonly chosen especially for chronic pain states. Consecutive treatments are usually necessary, and treatments can be initially as frequent as every 1 to 2 days, but are usually done on a weekly basis for a number of sessions. For ongoing pathology such as osteoarthritis, maintenance treatment is recommended from once weekly to monthly or less.

Sites of Treatment

Principles of treatment of chronic pain must address a number of factors. The acute pain and inflammation must also be treated through acupuncture or other means to reduce the propagation of the chronic nature of the presenting problem. Use acupuncture points at the location of the initiating source of pain. Use points that have a segmental or autonomic effect.

Table 1. Common Acupuncture Points Used for Variable Pain States and Locations

| Pain state and location | Common acupuncture points used |
|-------------------------|---|
| Inflammation | LI4, GV14, LI11 |
| General pain | LIV3, GB34, BL60, GV20, SP6 |
| Neuropathic pain | ST36, PC6, TH5 |
| Bone and arthritic pain | BL23, KID1, KID3, BL11 |
| Neck pain | <i>Jing Jia Ji</i> , SI3, BL23, BL24, BL25 |
| Hip pain | GB27, GB28, BL54, <i>Jian-Jiao</i> |
| Elbow pain | SI8, PC3, HT1, LI11, LU5 |
| Back pain | <i>Hua-tuo Jia Ji</i> , <i>Bai Hui</i> , <i>Shen Shu</i> , BL40 |

Use points that can impact on reflexes between physiologic systems. Treat points related to tissue and structural compensation, such as trigger points, or myofascial origins or insertions often distant to the location in question. See [Figure 3](#). Some meridians have been verified or at least physiologically demonstrated distally by following trigger points.^{43,44} Observation of gait, palpation for muscle tenderness and temperature differences, awareness of organ involvement, and other forms of pain recognition aid in determination of useful acupuncture points. Follow principles of TCVM to treat the individual needs, and analgesia usually follows. A recipe of points will be helpful for the novice to begin therapy, until more training or experience is acquired. [Table 1](#) briefly lists basic examples of points that can be added to an analgesic protocol. Detailed point descriptions can be found in veterinary acupuncture textbooks.

Conclusion

From the TCVM perspective, optimal prevention, treatment, and rehabilitation of persistent pain require an intimate understanding of the animal, including a comprehensive assessment of the individual's constitution, environment, diet, previous and ongoing injuries, and concomitant disease. Addressing the pathophysiological patterns is paramount. Acupuncture in its many forms can be used independently or incorporated into conventional analgesia protocols and has demonstrated significant effect on hyperalgesia, neuropathic, and visceral pain states.

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