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Compendium

Acupuncture and Chinese Herbal Medicine for Treating Horses

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Abstract: *Acupuncture exerts diffuse analgesic effects through the release of endogenous opioids and other locally and centrally acting mediators. Successful therapeutic interventions for various musculoskeletal conditions in horses are well documented, and acupuncture may significantly enhance performance. The use of acupuncture is specifically supported in treating nonsurgical gastrointestinal disorders, in which specific techniques can alter motility and contribute to visceral analgesia. This article describes the use of acupuncture and Chinese herbal medicine for equine reproductive management and for treating respiratory disease. A careful review of available data and ongoing efforts to enhance unbiased research should continue to guide practitioners of evidence-based medicine in refining the most useful applications of acupuncture and Chinese herbal medicine.*

The increasing popularity of acupuncture and integrative therapies has brought awareness of the need for research and enhanced training in these emerging fields.[1] Equine practitioners face a barrage of information from owner experience, lay and scientific literature, colleague experience with unconventional modalities, and public interest in the philosophies of healing. This review of the available, pertinent literature—both experience- and evidence-based—highlights the reported strengths of acupuncture and related herbal therapy while offering insight into areas requiring further research and refinement before they are integrated into conventional practice.

Acupuncture: Demystifying the Effects

Early Chinese medicine texts, including *Yellow Emperor's Classic of Medicine* by Huang Di Nei Jing, describe the locations of acupoints (acupuncture points), the channels or meridians on which acupoints are often placed, and general guidelines for treatment. One early author stated that the practitioner must focus on myriad historical and clinical factors in recognition that "healing actually comes from within."[2] Researchers have been standardizing the previously diverse treatment approaches to elucidate the mechanisms behind acupuncture stimulation and the observed "healing." The acupoints, which were previously thought to represent arbitrary anatomic landmarks, indicate larger concentrations of neurovascular components, including mast cells, the Golgi tendon apparatus, and free nerve endings.[3–5] These findings have been complicated by extrapolation of the human acupoint system (which typically recognizes more than 300 acupoints) to horses, for which the *Yuan Heng Liaoma Ji* described 159 acupoints in the year 1608.[6] However, some veterinary acupoints have recently been refined[7] to reflect the neurovascular components, and the use of these acupoints should be encouraged to mold traditional acupuncture into a modern, informed, and physiologically sound treatment modality.

Mechanistic research into acupuncture has largely focused on widespread recognition of its perceived benefits in ameliorating pain. Reviews of the pathophysiology and pathways of pain highlight the complex interplay between local mediators, peripheral and central neurotransmitters, spinal control, higher centers, and descending pathways. Because broad reviews of the acupuncture literature have highlighted the role of acupuncture in all segments of the pain pathway,[8] a short primer on the mechanism is critical to objective understanding.

Sensory fibers form the foundation of nociception; traditionally, these fibers have been labeled Aβ, Aδ, or C. Aβ fibers have large diameters, low activation thresholds, and high levels of myelination, making them adept at quickly transmitting common stimuli. Aδ fibers have a smaller diameter, less myelination, and a higher stimulation threshold. Information regarding thermal and mechanical inputs is propagated more slowly in Aδ fibers than in Aβ fibers. C fibers are the smallest and slowest of the afferent fibers because of their unmyelinated axons. C fibers have the highest activation threshold. C fibers and Aδ fibers are capable of transmitting various nociceptive signals that end in the superficial aspect of the dorsal horn of the spinal cord.[9] At the level of the spinal cord, nociceptive-specific cells fire only when painful

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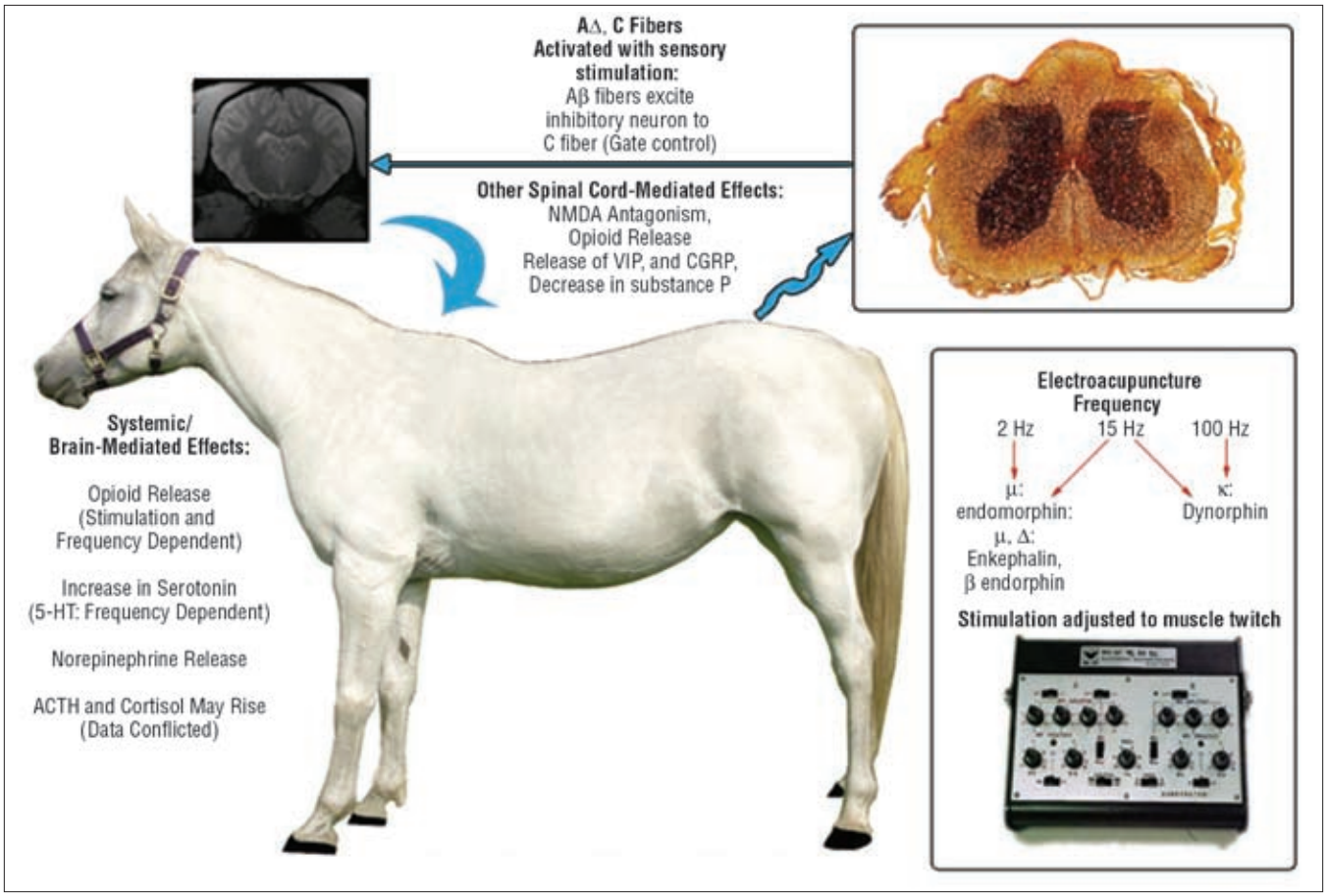

Figure 1. Acupuncture: potential mechanisms and mediators. ***ACTH*** = adrenocorticotropic hormone; ***CGRP*** = calcitonin gene-related peptide; ***NMDA*** = *N*-methyl-D-aspartate; ***VIP*** = vasoactive intestinal polypeptide.

stimuli are detected, thus maintaining synapses with only Aδ and C fibers.[10] Wide dynamic-range neurons also participate in transmission of pain. They collect information from all fiber types and produce a response compatible with the level of stimulation. These neurons are chiefly responsible for the windup phenomenon.[11]

Multiple factors contribute to windup, in which the neuronal response is augmented in level and duration. Transmitters such as calcitonin gene-related peptide (CGRP), substance P, and glutamate may have a role in activating the *N*-methyl-D-aspartate receptor, which chiefly mediates the windup response.[12] This response from the spinal cord is influenced by higher processing centers and vice versa. Descending pathways can enhance or diminish nociceptive activity; serotonin, via the 5-HT3 receptor, is likely facilitatory, while noradrenergic input is inhibitory. This complex interplay between pain-processing and feedback systems provides various therapeutic targets and mirrors the diversity of neurophysiologic research on the basis for acupuncture.

The veterinary literature suggests that acupuncture (1) has wide-ranging influence on descending pathways and (2) influences serotonin, endogenous opiates, neurotransmitter receptors, inflammatory responses, and the autonomic nervous system[13] (**FIGURE 1**). The gate-control theory of pain, espoused by Melzack and Wall,[14] has generated considerable attention from acupuncture researchers. In this system, electroacupuncture (the use of electrical current across acupoints) stimulation of Aβ fibers is thought to "close" the "gate" for pain input at the substantia gelatinosa in the superficial dorsal horn of the spinal cord, which, otherwise, would be "opened" by the larger nociceptive fibers.[15] The second chief area of interest is the descending pain pathway, as described above, which may further alter the activities of cells within the dorsal horn through interplay between serotonin, endogenous opioids, and noradrenergic transmitters. Longer clinical effects may be explained by neuroplasticity—the theory that the functional relationships and structural components of the nervous system may be reorganized according to new inputs.[16]

Most acupuncture research has employed electroacupuncture because of its profound effect on endogenous opioids and, by extension, descending pathways of pain inhibition. Professor Han of the Beijing Medical University authored pioneering work on the mechanisms of electroacupuncture and manual acupuncture. His studies established that (1) electroacupuncture-tolerant rats were also tolerant of morphine analgesia, (2) acupuncture analgesia could be transmitted between rabbits through cerebrospinal fluid transfer, and (3) the opioid receptor was responsible for acupuncture analgesia via attenuation of effects by naloxone.[17]

The contribution of endogenous opioids was further refined by receptor type and electroacupuncture frequency. Stimulation at 2 Hz promotes the release of endomorphin, which serves primarily as a μ-receptor agonist, along with enkephalin and β-endorphin (mixed μ and δ agonists). Stimulation at 100 Hz promotes release of dynorphins with selective κ-receptor activity.[18] Stimulation at 15 Hz appears to stimulate all opioids, thereby affecting all receptor types. Clinical use of acupuncture can therefore be informed by knowledge of stimulation intensity and subsequent receptor activity. Concurrent administration of opiates (e.g., morphine, butorphanol, fentanyl, hydromorphone) should be considered when selecting frequency of treatment.

While opioids have a relatively defined role in inhibiting pain transmission via descending pathways, the role of serotonin (5-HT) is less clear. Acupuncture appears to generally increase the serotonin level, contributing to a combined analgesic effect with endogenous opioids.[19] However, the prevalence of multiple subtypes of receptors with competing actions suggests a complexity to serotonergic effects.[20] A study of rabbits supported this theory; electroacupuncture analgesia was facilitated by 5-HT_1, 5-HT_2, and 5-HT_3 subtypes, with the exclusion of 5-HT_{1A} and 5-HT_{2A}, which suppressed analgesia.[21] Further studies are needed to fully understand how serotonin contributes to acupuncture analgesia.

The local and central effects of acupuncture needle insertion may influence the release and activity of substance P, a potent neurotransmitter involved in nociception locally and at the spinal cord. Higher levels of substance P in the tissue of canine acupoints have been reported, suggesting another neurovascular feature unique to acupoints versus nonacupoints.[22] In clinical application, electroacupuncture appears uniformly able to reduce local and plasma levels of substance P,[23,24] while spinal effects vary with the frequency of stimulation.[25] Receptor-level research has refined the understanding of the effects of substance P at the dorsal horn. Persistent inflammation appears to upregulate the neurokinin-1/substance P receptor, which, when activated by substance P, produces enhanced nociception and hyperalgesia. This effect was suppressed by electroacupuncture at 10 Hz; the study[26] authors also highlighted other work suggesting that activated opioid receptors (μ and δ) decrease substance P release and expression of neurokinin-1. Local injury may prompt release of nerve growth factor, which increases the synthesis and trafficking of substance P in the dorsal horn, thereby contributing to pain. One study[27] suggests that electroacupuncture decreases the negative effect of nerve growth factor in rats. Substance P will likely become a target for novel pharmacologic interventions, and clinical knowledge of electroacupuncture may prove beneficial in reducing the role of the compound in chronic pain.

In addition to how acupuncture controls neurotransmitters and receptor expression, recent human research has sought to explain gradual clinical improvement in patients over multiple treatments, referred to by some as *therapeutic acupuncture*.[28,29] In chronic pain, synaptic plasticity may contribute to this observation. Low-frequency (2 Hz) electroacupuncture contributes to long-term depression of C-fiber action potentials via *N*-methyl-D-aspartate antagonism, meaning that C fibers are persistently less active after treatment and that windup is prevented.[30] This spinal plasticity may be mediated by a number of substances that encourage the development of new interactions among neurons in damaged and undamaged spinal cords.[31] More broadly, electroacupuncture stimulates distinct brain centers,[32] which contributes to the development of new neural connections in animals with neurologic dysfunction or chronic pain. The amount of stimulation varies according to the frequency of application.[33]

To date, acupuncture-related laboratory research specific to horses has been more rudimentary than human and laboratory animal investigations. In horses, the research has focused on the model of acupuncture analgesia that emphasizes β-endorphins, cortisol, and adrenocorticotropic hormone. Early studies suggested that electroacupuncture releases cortisol and β-endorphins, although the findings did not correlate to the degree of analgesia observed in the study.[34] However, a similar study[35] that documented elevations in β-endorphin showed an effect on cutaneous analgesia. Thermal pain threshold studies demonstrated rising endorphin levels, which varied according to selected acupoints and correlated to the degree of analgesia measured.[36] In a small (n = 8), randomized, crossover study of mares, acupuncture and electroacupuncture increased cutaneous and visceral pain tolerance.[37] Analgesia was believed to correlate with measurable rises in met-enkephalin and dynorphins after electroacupuncture (2 to 100 Hz, variable frequency), although only enkephalin increases were statistically significant. These findings largely explain the short-term model of acupuncture analgesia. Long-term effects have not been substantially elucidated in horses.

Acupuncture: Materials and Methods

The location of many acupoints is based on the Chinese notion of meridians, or channels. According to classic Chinese texts, these lines transmit Qi (pronounced "chee") in the subcutaneous space where the needle penetrates, thereby establishing communication with other points and areas of the body. This concept has not been scientifically defined, and the diffuse effects of acupuncture may be largely explained by the aforementioned complex neural pathways and mediators. Many researchers have debated and studied the existence of acupuncture meridians,[38] and several articles have questioned the validity of confirmatory tests involving radioisotope studies,[39] thermal imaging,[40] and electrical conductance.[41] However, recent investigation using novel methodology is reigniting the debate on the existence and function of acupuncture meridians.

Injection of tracer into human acupoints has identified subcutaneous channels that were differentiated from lymphatic or vascular flow by angiography and that appeared only after administration of tracer at specific acupoints.[42] In sheep, acoustic emission signals have been measured and propagated along meridians.[43] Within this model, the 14 major meridians were tested using 84 acupoints. Researchers found significant signal-strength increases over baseline in 85% of acupoints and only 28% of control points ($P < .01$), suggesting preferential communication

Table 1. The Most Common Methods of Equine Acupuncture

Method	Technique	Indications	Contraindications	Advantages	Disadvantages
Dry needling (white needle; the traditional acupuncture needling technique)	Smooth, rapid insertion of a filiform 28- to 32-gauge acupuncture needle (13–100 mm in length) at a depth and angle directed by the location of each acupoint	Most conditions and almost all acupoints	Insertion into neoplasia, scar tissue, or areas of infection	Relatively inexpensive; requires no electronic equipment; suited to various conditions	Lower stimulation than that provided by electroacupuncture; requires more frequent treatments
Electroacupuncture	Needle insertion followed by placement of electrical leads using machines; common frequencies include low (2 Hz; endorphins, enkephalins), middle (100 Hz; dynorphins), and high (200 Hz; serotonin)	Neuromuscular stimulation; paralysis; severe pain; induction of adjunctive surgical analgesia	Cardiac arrhythmias; shock; epilepsy; pacemaker; dermatitis; pregnancy (electroacupuncture not recommended near the ventral abdomen); neoplasia (electrical leads should never cross a mass)	Increased stimulation; solid scientific data supporting use	Equipment is required; 20–30 min required; leads may be difficult to keep on certain horses
Aquapuncture (acupoint injection)	Insertion of a hypodermic needle (appropriately sized for the horse) and injection of fluid (generally vitamin B_{12} or saline; 2–10 mL per site)	Conditions associated with pain; muscle atrophy; internal conditions; when traditional acupuncture is unavailable; may be used as an adjunct treatment	Some dermatitis cases	Inexpensive; less time-consuming compared with traditional needle placement or electroacupuncture	May be less effective when used alone versus traditional techniques or electroacupuncture
Hemoacupuncture (red needle)	A hypodermic needle is used to puncture a blood vessel to draw blood (5–20 mL per acupoint)	Conditions associated with acute-onset inflammation or fever	General weakness; anemia; pregnancy; dehydration; weakness; during winter or in cold environments	Quick; inexpensive	May cause excessive bleeding if the needle is too large for the particular point or if the horse has an underlying coagulopathy
Moxibustion	A moxa stick (made of *Artemisia* leaves) is burned near acupoints	Cold environment; local swelling; pain	During summer or in hot environments	Can be conveniently used by horse owners	May cause smoke and an unpleasant odor

between same-meridian points. On functional magnetic resolution imaging studies, rabbits showed specific activation of neural centers at different acupoints, and related work in humans suggests that stimulation of acupoints on the same meridian activates similar brain centers.[44,45] Despite the lack of conclusive clinical correlates from meridian studies, meridians, as presently established, provide useful anatomic locations and nomenclature for acupoint selection by practitioners.

Another important concept is that of organ-associated, or back-shu, acupoints, which allow practitioners to treat internal organ pathology via stimulation of areas on the epaxial musculature of horses. Although the concept may appear implausible, evidence suggests that acupuncture at superficial sites may alter blood flow to internal organs.[46] This may be mediated, in part, by neural somaticovisceral reflexes, which have been described in humans and laboratory animals.[47] The proximity of back-shu points to the dorsal horn of the spinal cord and to the internal organ they are said to represent could allow empiric therapy that capitalizes on these neural connections. A combination of meridian and back-shu points is often used to achieve a clinical result.

Multiple methods of acupoint stimulation are available, including traditional methods and modern adaptations (e.g., electroacupuncture). These methods include traditional needle stimulation with a small (28- to 32-gauge), usually stainless-steel, filiform or round-sharp needle; the injection of sterile saline or vitamin B_{12} solution into the acupoint (aquapuncture); drawing blood (hemoacupuncture); the introduction of air (pneumoacupuncture); laser stimulation; or the application of heat by burning an herb (moxa) on the needle's handle or point[48] (moxibustion; **TABLE 1**).

Clinical efficacy has been reported for all of the above methods in humans; however, most research in horses, as in humans, has focused on the use of electroacupuncture. Protocols for the duration and electrical frequency vary; however, 15 minutes of stimulation is likely adequate for clinical effect, and bilateral stimulation appears to be more efficacious than unilateral application.[49,50]

Table 2. Acupoints for Treating Laryngeal Hemiplegia[a]

Acupoint	Anatomic Location
CV-23	On the ventral midline of the neck, just cranial to the larynx
GB-21	In a depression located halfway along the cranial margin of the scapula
Hou-bi	Caudal to the mandible, 6 cm dorsal and cranial to Hou-men (on the jugular vein, 3 cm caudal to the larynx)
Hou-shu	On the ventral midline at the third tracheal ring
LI-15	Immediately cranial to the point of the shoulder (greater tubercle)
LI-17	On the brachiocephalicus muscle, 6 cm craniodorsal to the point one-third the distance from the shoulder joint along the cranial scapular margin
LI-18	The depression just above the jugular groove, found by following the ventral mandible with the head extended
SI-17	Just caudal to the mandibular ramus, exactly halfway between the dorsal and ventral margins of the ramus
ST-9	In the depression caudal to the angle of the mandible

[a]Some references and practitioners use a unit of measurement known as the *cun*, which is based on a traditional scaled measuring system that varies depending on the total area of the body segment on which the point is located. In general, most points were discovered because of a palpable depression at the site.

For basic "dry" needle insertion, small-gauge needles are used, ranging in length from 13 mm for acupoints just proximal to the coronary band to 75 mm for acupoints adjacent to the coxofemoral joints. Although needle depth largely depends on the practitioner's preference, recent research using functional magnetic resonance imaging in humans highlighted similar findings between superficial (Japanese) and deep (Chinese) needling.[51]

Aquapuncture, another common stimulation method, is thought to provide longer stimulation of the acupoint until the fluid, saline, or vitamin B_{12} is absorbed. Injection at the acupoint produces physiologic responses similar to those of fine-gauge needle insertion.[52] In China, various sterilized substances are used in aquapuncture. Injectable herbs are not available in the United States, so vitamin B_{12} and saline are used most often. Further research is necessary to evaluate the response rate of horses to this technique.

Lameness: An Integrative Approach

Most equine practitioners who consider using acupuncture focus on its clinical applications for treating lameness and associated musculoskeletal disorders, and these applications appear to be strongly supported by the current model of acupuncture analgesia. Human and veterinary clinicians find acupuncture to be well suited to restoring normal activity and function after musculoskeletal problems, with the caveat that conformational challenges may complicate or lengthen treatment.[53]

From a modern Chinese medical perspective, the cornerstone of the equine lameness evaluation is palpation, or scanning, of acupoints using a blunt probe. Specific acupoints are thought to be associated with primary sites of lameness. For example, when a horse reacts to LI-18 in the cervical region (**TABLE 2**), imbalance or pain in the distal joints of the ipsilateral forelimb is suspected.[54] This acupoint sensitivity may result from altered muscle compensation associated with lameness and the formation of myofascial trigger points, which have recently been described in horses.[55] Beyond the musculoskeletal uses of acupuncture in horses, diagnostic acupoints have been described for other conditions, mainly infectious diseases with neural or muscular manifestations, although limited clinical trials have not provided confirmation.[56]

Whether the lameness examination involves conventional, Chinese medical, or, ideally, integrative diagnostics, the acupuncture treatment is tailored to the individual and includes multiple acupoints adjacent to the localized cause. Studies evaluating this approach have varied widely in experimental rigor, methodology, and results. Early studies on chronic laminitis (n = 10) and navicular disease (n = 10) in small populations showed no significant difference between groups regarding stride length and force-plate analysis.[57] Chronic back pain responded positively to various stimulation techniques in multiple studies involving 200 horses, but these studies did not include control groups.[58–61] In a more recent prospective study, three electroacupuncture treatments sufficiently ameliorated uncomplicated chronic thoracolumbar pain in 15 horses.[62]

In a randomized, double-blind, controlled trial involving a treatment group of 16 Thai sport horses, control horses with chronic back pain for 3 months or longer received sham acupuncture and were rested for 15 days.[63] The treatment group received electroacupuncture in local acupoints and was rested for a similar amount of time. The pain threshold was quantified with pressure algometry to avoid more subjective pain scoring systems, and the results revealed statistically significant differences, although no correlation was made to clinical or owner-based observations.[64]

There has been considerable interest in the possible use of acupuncture for pain reduction and detection of subclinical lameness in racing Thoroughbreds; therefore, many large equine training facilities integrate acupuncture into their treatment and preventive care regimens. Despite this large equine population, few studies have documented the effect of acupuncture on specific performance parameters. A study of aquapuncture analyzed cardiovascular and metabolic parameters in 18 Thoroughbred racehorses.[65] Chinese diagnostic methods were used to classify horses according to endocrine, gastric, stifle, hock, and coxofemoral abnormalities. Therefore, acupoint selection varied between horses based on their diagnostic sensitivity. The only parameter that showed statistically significant improvement was blood lactate, but the performance correlation of the measured differences remains unclear. The authors note that five of six horses won races after treatment, whereas none had won before treatment. This anecdotal support is similar to that from trainers and owners who continue acupuncture therapy solely because of an apparent correlation to performance enhancement.

Despite the inadequacies of studies regarding veterinary acupuncture and the lack of standardized treatment due to practitioner preference and tailoring of acupuncture to individual patients, studies on using acupuncture to treat lameness due to various causes have shown promising results. A simplified statistical review of English- and Chinese-language studies on this topic found acupuncture to have a >80% efficacy in resolving or improving lameness due to back pain, shoulder pathology, fetlock injury, laminitis, and paresis or paralysis.[66] Exact acupuncture protocols varied in each study because practitioners select acupoints based on experience and then modify them based on clinical response.

Laryngeal Hemiplegia: a Noninvasive Alternative

Neural stimulation and regeneration are classic applications of electroacupuncture. Experimental models using rabbits and rats have demonstrated dramatic improvements in crushing injuries[67] or complete transections of the sciatic nerve,[68] and electroacupuncture appears capable of regenerating multiple fiber types in these injuries.[69] In less severe pathology, electroacupuncture has shown clinical efficacy in humans. In a nonrandomized, retrospective pilot study of polyneuropathy of unknown cause, 16 of 21 (76%) patients improved in subjective scoring and in nerve conduction studies.[70]

These studies are most relevant to the role of electroacupuncture in treating laryngeal hemiplegia, which generally has an idiopathic origin, whereby large myelinated fiber dysfunction contributes to secondary mechanically induced complications such as exercise intolerance, inspiratory noise, airway resistance, and diminished airflow.[71] Surgical approaches to overcome adduction of the arytenoid cartilages are well described, and each has its own complications and reported success rate. Regardless of predicted surgical outcomes, the comparatively noninvasive approach of acupuncture is promising for pragmatic reasons and for its lack of complications compared with other approaches.

Early human reports suggested that treatment of laryngeal nerve pathology using a mixed-modality approach, including acupuncture, in a small number of patients (n = 14) resulted in clinical recovery.[72] Data from canine nerve transection followed by electrical nerve stimulation via an implanted device, unrelated to acupuncture principles, showed histologic evidence of regeneration along with maintenance of functional laryngeal musculature.[73] Clinical reports of responses in horses are becoming more common.

In a recent retrospective study of 18 horses treated by the University of Florida acupuncture service, promising outcome data emerged. In all cases, the standing endoscopic grade improved.[74] Because the study was retrospective, neither stratification nor controls were present. Pretreatment grading ranged from IIa to IIIb, with outcomes ranging from normal to IIb, using the common grading nomenclature for describing the degree and maintenance of arytenoid abduction. In this study, a combination of low-frequency (10 minutes at 20 Hz) and high-frequency (10 minutes at 80 to 120 Hz) stimulation was reported. The electroacupuncture approach was standardized: CV-23 to left GB-21, left LI-18 to left LI-17, left Hou-shu to right Hou-shu, bilateral ST-9 to Hou-bi, and bilateral SI-17 to LI-15 (**TABLE 2**). The preliminary data appear promising; future studies should focus on response rates within grades, persistent observational changes in laryngeal function, and differences between reported acupuncture protocols. Given the benefits and benign nature of electroacupuncture, increased use of it for laryngeal hemiplegia is warranted.

Gastrointestinal Effects of Acupuncture and Chinese Herbal Formulations

Research and anecdotal evidence support the use of acupuncture for treating conditions other than musculoskeletal and performance-related pathologies. For example, treatment of colic by integrative management of medical gastrointestinal (GI) disorders or by adjunctive postsurgical care has been described.

Experimental models have sought to evaluate the observed visceral analgesic effect of electroacupuncture. A rectal distention model of colic pain in mares using multiple acupoints found "useful" rectal analgesia.[75] However, acupuncture limited to one acupoint, BL-21 or Guan-yuan-shu, did not alleviate discomfort associated with experimental small intestinal distention.[76] The results of these two contrasting studies show the inherent challenges in standardizing treatment protocols and experimental models to provide meaningful data. The following could be deduced regarding acupuncture: BL-21 is ineffective, multiple points are necessary, small intestinal pain cannot be relieved, electroacupuncture frequencies play a role in the differences between results, and acupuncture for GI analgesia in horses is unreliable given the available data. Despite isolated case reports that support this use of acupuncture,[77] there are no conclusive scientific data in English-language journals from which to propose a complete mechanism for the reported success of acupuncture for GI analgesia in horses.

In addition to acupuncture providing some degree of visceral analgesia, a motility-modifying effect likely explains the reported clinical achievements associated with acupuncture. Studies in other species show profound GI effects from acupoints traditionally associated with the treatment of GI disorders. For example, in rats, ST-36 promotes distal colon contractility mediated through a cholinergic mechanism.[78] In cats, the same acupoint affects esophageal motility, gastrin, motilin, and vasoactive peptide, suggesting wide-ranging GI effects that likely have a neurochemical origin.[79] GV-1, an acupoint frequently used for treating diarrhea, suppressed proximal colonic motility in dogs by decreasing the frequency and duration of colonic contractions; acupoints that are not typically associated with treating diarrhea had no effect.[80] After stimulation of BL-21 (the stomach-associated back-shu acupoint), gastric motility increased in dogs.[81] The effects of specific acupoints in horses are currently being investigated; additional research is needed to evaluate the use of acupuncture in treating colic.

The therapeutic goals of acupuncture for GI disorders are to alleviate or reduce visceral pain while normalizing GI motility. In China, the traditional "pattern diagnosis" system is generally

Table 3. Common Acupoints for Treating Gastrointestinal Disorders

Acupoint	Anatomic Location
GV-1	In the depression between the anus and the ventral aspect of the base of the tail
ST-36	6 cm below the patella, 1.5 cm lateral to the cranial aspect of the tibia, in the cranial tibialis muscle
SP-6	6 cm proximal to the medial malleolus, just caudal to the tibial border, and 1.5 cm caudal to the saphenous vein
Bai-hui	On dorsal midline at the lumbosacral space
BL-20	At the 17th intercostal space, 9 cm lateral to the dorsal midline
BL-21	Caudal to the 18th rib, 9 cm lateral to the dorsal midline

Table 4. Common Acupoints for Treating Reproductive Disorders

Acupoint	Anatomic Location
GV-3	On the dorsal midline overlying the intervertebral space between L4 and L5
GV-4	On the dorsal midline overlying the intervertebral space between L2 and L3
Bai-hui	On the dorsal midline at the lumbosacral space
Yan-chi	One-half the distance between the proximal border of the tuber coxa and Sheng-peng (the point located 6 cm from the dorsal midline at the center of L6)
Shen-shu	6 cm lateral to the dorsal midline at the lumbosacral space (Bai-hui)
BL-23	9 cm lateral to the dorsal midline at the second lumbar intervertebral space (L2-L3)

employed to guide treatment, but acupoints with a diffuse array of effects can be chosen. Frequently selected acupoints include GV-1 (especially for treating diarrhea), ST-36, SP-6, Bai-hui, and acupoints on the back that are associated with the GI tract, namely BL-20 and BL-21[82] (**TABLE 3**). At these acupoints, electroacupuncture is useful at a recommended combination of low and high frequencies. Dry needling and aquapuncture are also appropriate.

Herbal formulations are commonly used in the integrative treatment of GI disorders. Equine patterns of diarrhea and subsequent herbal selections have been described.[83] The herbs in these formulations have a plethora of functions, including antispasmodic effects,[84] immunomodulation,[85] and alteration of biochemical and bacterial parameters.[86]

In the absence of precise data governing herbal pharmacokinetics and activities, there have been multiple Chinese studies on herbal formulations, typically comprising multiple herbs that are said to work in conjunction; however, these studies have generally been performed without a rigorous experimental design. In one laboratory study, experimental diarrhea in mice was treated with Bai Tou Weng Tang (a combination of pulsatilla, phellodendron, coptis, and fraxinus) or each herb alone; the classic clinical formulation resolved diarrhea faster, but each herb alone had stronger antibacterial action than the formulation.[87] The same formula has shown efficacy (i.e., clinical resolution in 3 days) in an outbreak of acute hemorrhagic calf diarrhea of unknown cause.[88] In a review of the use of Ping Wei San in horses, the formulation was associated with positive clinical outcomes of chronic GI conditions, including pica and gas colic.[89] Although many of these retrospective studies lack the design required to apply their results broadly, they provide a foundation for independent clinical investigation to verify the Chinese literature.

Reproduction: Integrative Management

While GI disorders largely manifest as acute indications for acupuncture, there is considerable interest in using acupuncture in the ongoing, integrative management of equine reproduction. In a survey of data on multiple species, acupuncture showed efficacy in normalizing the hypophyseal–pituitary–gonadal axis,[90] augmenting sperm counts,[91] inducing estrus,[92] treating infertility among dairy cattle,[93] and improving the success of human in vitro fertilization.[94] Equine reports include conflicting findings regarding prostaglandin administration at acupoint Bai-hui (at the lumbosacral junction); current research shows no advantage over using a nonacupoint despite previous reports that suggested enhanced effects of using Bai-hui, which has traditionally been associated with treating fertility disorders.[95]

A review of equine reproduction provided strong anecdotal support for the use of Chinese medical therapies, including acupuncture, as adjuncts to conventional interventions.[96] However, the author suggested that it was difficult to predict the hormonal response to treatment. Despite these ongoing challenges, clinical studies in China highlight the promising role of herbal formulations for treating reproductive disorders. In one example, an herbal formulation was given to infertile mares with anestrous or anovulatory follicles. After two to six treatments, 685 of 734 mares had normal estrus and eventually conceived.[97] In a retrospective study on goats with endometritis, the condition resolved in most (53 of 57) subjects after 6 days of therapy with a formula based on the Chinese pattern associated with endometritis.[98]

Common acupoints for managing a range of reproductive disorders include Bai-hui, GV-3, GV-4, Yan-chi, Shen-shu, and BL-23 (**TABLE 4**). Caution should be exercised in using acupuncture to treat pregnant mares: ideally, only clinicians with specialty training should treat pregnant mares because of the risk for iatrogenic induction of abortion, despite little evidence definitively linking acupuncture and abortion.

Equine Respiratory Disease: Can Herbs Help?

Clinicians who are not comfortable with using acupuncture are often hesitant to use herbal formulations, especially given the

Critical Points

- The classic model of acupuncture analgesia based on endogenous opioid release is well supported in horses. Research in other species suggests that other mediators are responsible for long-term clinical effects.
- Various acupoint stimulation methods are available to practitioners. Most of these methods are appropriate for treating musculoskeletal disorders—the classic indication for acupuncture, and the most widely studied area in horses.
- As an adjunctive treatment of surgical colic or a stand-alone therapy for medical colic, acupuncture or herbal medicine may alter visceral pain thresholds, regulate GI motility, and alter regional blood flow.
- Some herbal formulas show promising results in laboratory investigations and clinical reports. These formulas may prove valuable in treating chronic respiratory disease and reproductive disorders when more clinical data are available.

relatively basic pharmacokinetic and drug interaction studies performed to date. Herbal selections are based on classic antecedents or formulations from early texts of human and veterinary Chinese medicine. These botanical treatments and their subsequent modifications represent experience-based pharmacology, just as acupuncture stems from experience-based physiologic responses to needling.

Although no veterinary case reports regarding herb–drug interactions or toxicities have been published, human cases and concerns have been documented.[99] Adverse events are generally categorized as follows: an unpredictable and likely unavoidable adverse event due to patient allergy or reactivity, improper use (e.g., when ephedra was used at supraclinical doses for an unintended purpose), contamination during production or processing, misidentification of a medical plant, and herb–drug interactions.[100]

Knowledgeable and appropriately trained practitioners generally avoid using herbs at high doses, reducing the risk of an adverse event. Because of increased scrutiny, many herbal suppliers are providing more information about their sources and the processing of herbal formulations. Some medicinal ingredients have undergone scientific review. Cinnabar, which contains mercury sulfide, has been used in multiple herbal formulations; despite its relatively low oral toxicity, it is not used in veterinary formulations in the United States.[101]

Herb–drug interactions have become a primary focus of integrative medicine research. Given the broad pharmacologic activity of herbs and their likely lower levels of active constituents compared with pharmaceuticals, evaluating traditional pharmaceuticals against representative herbs may prove beneficial.[102] Because the regulation of herbs has increased in Europe,[103] it is plausible that manufacturing and quality-control regulations will increase in the United States. However, because of the expense and breadth of the herbal formulary, it is unlikely that costly pharmacokinetic studies will match those of conventional drugs, which generally have more narrow pharmacokinetic activities.

Despite the lack of in vivo clinical trials involving herbs, the Chinese polypharmacy for respiratory conditions has attracted considerable interest. Multiple case studies have suggested success in treating acute and chronic equine respiratory conditions with herbal formulations such as modified Bai He Gu Jin Tang, Ge Jie San, and Si Jun Zi Tang.[104,105] In a pilot study involving six horses with recurrent airway obstruction, treatment with a proprietary Western herb blend (including some of the same herbs in many classic Chinese formulations) significantly decreased the horses' respiratory rates.[106] In a review of Chinese herbal formulations for treating equine respiratory disease, including a laboratory investigation of the constituent herbs, evidence supported the use of the formulations for the following: expectoration, reduction in smooth muscle contraction, antimicrobial effects, T-helper immunomodulation, macrophage stimulation, antioxidant properties, inflammatory cytokine downregulation, antiinflammatory effects, antihistaminic properties, and antitussive properties.[107]

The literature from China demonstrates the potential broad applications of herbal prescriptions for treating many conditions in veterinary medicine. Four reports highlight the promising role of Xin Yi San for treating chronic sinusitis in horses.[108–111] In a clinical trial in which Zhi Sou San was used to treat chronic coughing in 50 horses, clinical signs resolved in 90% of the horses.[112] A similar response rate was reported when Wei Jing Tang (aqueous extract) was used to treat pneumonia: 19 of 23 mixed animal cases, including 14 horses, responded to 6 days of high-dose administration of the herbal formulation, although the primary causative agents were not reported.[113] Further double-blind, randomized trials are required to objectively evaluate the consistency and clinical effect of herbs in practice.

Equine Acupuncture and Herbal Medicine in Practice: Prospects and Challenges

A superior doctor is able to gather all techniques and use them either together or separately … and to consider the many variables in the treatment of a condition. Thus, it is understood that even though treatment methods are different, all can succeed in healing a condition.

This statement, which is from a foundational text of Chinese medicine from the second century BCE,[2] highlights the approach of acupuncture and its related modalities. Traditional Chinese medicine adopted a philosophical framework for evaluation based on observation of clinical signs and their relationship to perceived organ systems. This framework was rooted in the goal of establishing a "pattern" diagnosis: a collection of environmental, historical, biologic, and observational factors suggestive of an underlying disorder in the body.[114] Western diagnoses, which dominate current practice paradigms, often fail to neatly translate into a comparable Chinese medicine pattern. For example, in Chinese medicine, degenerative joint disease may be expressed in four or more different patterns, depending on factors unrelated to the rigid conventional diagnosis and the relevant clinical signs.

Over thousands of years, these patterns were refined and subsequent treatments devised to address the corresponding

imbalance or disease. Modern scientific evaluation of these modalities is a relatively recent phenomenon, often complicated by the lack of rigid, controlled trials and by inherent differences in therapeutic approach, which varies with each patient. The confidence that acupuncture practitioners have placed in "experience-based" medicine has been challenged by clinical veterinarians who cite the lack of proper experimental controls and treatment conformity.[115] Consequently, a recent meta-analysis of acupuncture in veterinary medicine concluded that there is an absence of "sufficiently compelling" evidence to recommend or reject acupuncture at this time.[116] Opponents of acupuncture have suggested that current research "does not favor the use of this technique."[117] Nonetheless, the physiologic insights into the effects of acupuncture, coupled with clinical information regarding its indications, should encourage practitioners to consider the benefits of integrative therapy relative to its minimal adverse effects while recognizing the need for further clinical data.

The discussion of equine reproduction and equine respiratory disease in this article highlights the challenges facing the developing field of integrative veterinary acupuncture. Within human and veterinary medicine as well as the general public, there is a desire and need to integrate and challenge Western and Chinese medical systems. The individualized, variable, multifactorial, and observational approach of traditional Chinese veterinary medicine is difficult to study in randomized, controlled clinical trials, more of which are certainly needed. Nonetheless, the long history of empiric therapy and observation in Chinese veterinary medicine enhances its credibility, and important details and the physiology of this modality are just beginning to be revealed. While currently debated, acupoint stimulation may achieve a widespread analgesic effect while recruiting local mediators and affecting visceral organ systems. The relatively benign nature of acupuncture also offers justification to continue its use. With time, more veterinary practitioners may adopt a fusion of Western and Chinese medical systems to "gather all techniques" to enhance their ability to achieve healing, as described by ancient Chinese doctors.

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