The Need for Consistency and Comparability of Transpositional Acupuncture Points across Species

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Most would agree on the importance of the correct localization of acupuncture points to provide effective treatment but in animals, which locations are correct? Two systems currently exist in veterinary acupuncture: the Traditional Chinese Veterinary Medicine (TCVM) or classical set of points and the transpositional points (Table 1). The TCVM points arose in China long ago for many species (Table2).[1-3]

Transpositional points, on the other hand, are acupuncture points in animals which were "transposed" from the human to the non-human. Transpositional point atlases can be constructed for practically any veterinary species, after defining the key anatomical features of the human location that need to be found in the non-human.

Table 1: The number of acupuncture points in the channels (meridians) in humans

Acupuncture Channel	Total number of Points
Lung	11
Large Intestine	20
Stomach	45
Spleen	21
Heart	9
Small Intestine	19
Bladder	67
Kidney	27
Pericardium	9
Triple Heater	23
Gallbladder	44
Liver	14
Governor Vessel	28
Conception Vessel	24
Total	**361**

Table 2: Number of TCVM acupoints recognized in different species, compared to the human

Species	Number of acupuncture points
Human	361
Horse	173
Cattle	103
Pig	84
Camel	77
Sheep	75
Dog	76
Rabbit	51
Duck	35
Chicken	34

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The degree of success of this transpositional system will depend on the presence or absence of comparable structures in the non-human and their capacity to deliver similar physiologic effects as in the human.

THE TCVM SYSTEM OF ACUPUNCTURE POINTS

Equine acupuncture atlases are available and even trace back to 1399.[1] The TCVM points illustrated in the early texts did not follow linear trajectories but were located on isolated spots. The TCVM point names reflected associated organs or anatomy. Two centuries later, equine acupuncture illustrations in Yuan-Heng's Therapeutic Treatise of Horses (*Yuan-Heng Liao Ma Ji*) revealed far more points.[2] *Yuan-Heng Liao Ma Ji* was written by Yu Benyuan and Yu Benheng and published in 1608. This book contained many charts that showed the location of equine acupuncture points, in addition to a chapter titled "What are the equine acupuncture points?"

Many of today's TCVM acupuncture atlases contain points whose locations were determined long ago, based on hemoacupuncture or organ associations. TCVM point tallies vary across species, as shown in Table 2. Hua states that 74% of TCVM points in pigs fail to occur in humans, and estimates that only 20% of classical acupuncture points in the pig exhibit similarities to human point locations.[3] Although veterinary acupuncturists have employed these points for centuries, the underlying structural and functional relationships accounting for their applications remain largely unexamined.[4, 5]

MOVING TOWARD A TRANSPOSITIONAL LOCATION SYSTEM

The variability in veterinary acupuncture point locations has drawn considerable criticism, not only from skeptics but also from students who earnestly desire to master acupuncture, yet become frustrated when they learn that many instructors and practitioners place the points in different locations. Animal acupuncture points have been derived from Chinese point drawings as well as from transposing one or more systems of human acupuncture points onto animal anatomy. As Krueger stated, "Published charts of supposed classical and transpositional points in horses have failed to agree on a single point of association."[6] Krueger also found that the Back *Shu* points in the horse occur at different spinal levels than in the human and located the equine equivalent of the human system along the outer Bladder line.[6] She further noted that ST-36 in the horse appeared at the location usually ascribed to GB-34, while GB-34 was located more closely to the comparable human location of GB-33.[6]

Inconsistent point locations present hurdles to comparative acupuncture research. For example, the human point, *Bai-hui* is GV 20, on the vertex. *Bai-hui* in the non-human occurs at the lumbosacral junction. Thus, two points with the same name have markedly different locations between humans and non-humans and, as a result, will have different physiologic effects and applications.[3] If authors fail to mention the exact locations of the points they employ and only state their names, reproducing such research in the same or other species will be impossible, and the results will add to the confusion.

Most of the points taught in contemporary veterinary acupuncture courses for canine, feline, and avian species never existed before North American veterinarians began studying acupuncture in the 1970's. As such, these transpositional point systems were created *de novo* in the late 1900's, and were derived from human acupuncture atlases.[4,7,8] Nevertheless, it is as yet unclear how many human points truly and rationally exist in each species. Should points be added or subtracted to accommodate more vertebrae or fewer evolved digits? Or, should all of the points from the human find a home on the non-human, regardless of species-specific anatomy, as in the currently accepted system taught throughout North America?

CREATING NEW POINTS – THE DEVELOPMENT OF A TRASPOSITIONAL VETERINARY ACUPUNCTURE SYSTEM BASED ON HUMAN LOCATIONS

Kothbauer provided insight into the historical underpinnings of the transpositional system.[9] He stated: "In China, traditional Chinese veterinary medicine (TCVM) developed as a specialization separate from TCM. Initially, very little was known in the West about animal acupuncture and knowledge of human acupuncture was largely used for orientation in animals. Direct localization of acupuncture points and the courses of the meridians were simply taken over from humans. Although this was of fundamental importance for entry into this interesting medical method, the differences between man and beast later became apparent. Different anatomy rendered direct extrapolation of human acupuncture points to animals impossible. In the quadruped body of, for example, a horse, the classic sport and racing animal, the fore and hind limbs are angled at 90°. The static and dynamic

forces during walking load the spine differently in the quadruped body from the forces loading humans walking upright. The relative importance of acupuncture points and meridians can therefore vary. Although it has proved impossible as yet to introduce a standard nomenclature based on anatomical definition of the acupuncture points for the different animal species, the topographical study of acupuncture points presented in this review for cattle should also provide a stimulus and challenge for studies on the horse."

No single, anatomically precise method has as yet been instituted to systematically document and verify the comparative point location for each and every human point onto other species. Different sources for point location vary as to how they accommodate intra-species and inter-species anatomical variation. Studies sometimes introduce electrical point-finders to verify point locations, although point-finders are notoriously unreliable in humans and much more so in non-humans.[10] Kothbauer provided his own unique association point system designed specifically for bovine acupuncture, based partly on anatomy and partly on his personal experience.[11]

A CLOSER LOOK AT TRANSPOSITION HURDLES

Horse anatomy poses obvious transposition questions, mainly due to the differences in equine distal extremity anatomy, compared to humans. Currently, all of the Jing-well points on the tips of the human fingers and toes have been placed around the sole digit (Digit III) of the horse. Due to this rough extrapolation, human and equine Jing-well point innervations and vascular supply vary considerably, as do related muscles, bones, and ligaments.

Locating LI-4, a commonly used acupuncture point in both research and practice, illustrates some of challenges posed by the transpositional acupuncture system. This point on the human manus lies in the first dorsal interosseous muscle, midway along the shaft of the second metacarpal bone. Human practitioners place LI-4 in the category of the four strongest acupuncture points in the body, along with LIV-3, SP-6, and ST-36.[12]

The physiologic impact of LI-4 can be understood, at least in part, by recognizing the scope of its innervation. Depending on needling depth, LI-4 can influence every nerve transmitted by the brachial plexus. These include: 1) The radial nerve (C5-T1), which supplies the skin overlying the point; 2) The ulnar nerve (C7-T1), which innervates the dorsal interosseous muscle; 3) The median nerve (C6-T1), which supplies the muscles of the thenar eminence, if one needles deeply, and 4) the sympathetic fibers from the cranial thoracic spinal segments.

In the horse, the comparative point would exist on the medial aspect of the 2nd metacarpal bone (medial splint bone). This region is devoid of several physiologically significant structures found in the human, including the thick and fleshy first dorsal interosseous muscle with its rich supply of afferent fibers and blood vessels. Dogs possess a first dorsal interosseous muscle which, in contrast to the human muscle, is rudimentary and relatively non-functional. Thus, in both the horse and dog, structures and functions vary. As such, which facets of acupuncture stimulation should apply? Physiologic consequences (including changes in blood flow) from acupuncture stimulation depend on the types of somatic afferent fibers involved.[13] The frequency of stimulation, whether delivered manually or electrically, can also differentially excite various groups of somatic afferents, resulting in different outcomes in autonomic reflex responses.[13] Insufficient afferent stimulation fails to deliver the desired effect.[14] Based on the author's experience in both human and veterinary medical acupuncture practice, the act of inserting and stimulating an acupuncture needle into a human hand at LI-4 gives a much different feel and response than doing the same at the canine or equine comparative site. One of the gross anatomical differences between primate and non-primate hand structures accounting for this palpatory distinction involves the relatively more bulky musculature of the human hand, accounting in part for the primate's manual strength. Increased numbers of proprioceptors contained within the muscles of the hand augment manual dexterity. Acupuncture stimulation affecting these proprioceptors delivers a far greater impact on the primate nervous system than in animals lacking a similarly rich population of afferent neural structures.

Similar anatomical considerations and concerns exist when trying to apply all 361 human points to animals. How will researchers be able to compare manual versus electrical stimulation for certain points in non-humans, if the neuroanatomically and neurophysiological equivalent of the human location fails to exist?[15]

NERVES AS THE FINAL COMMON PATHWAY IN ACUPUNCTURE

Ancient point prescriptions indicate that the early acupuncturists recognized somatovisceral and

Table 3: Examples of common acupuncture points and their applications

Acupuncture point	TCM Function[44]	Neuroanatomical Explanation
GV-26	Revives consciousness, calms the spirit, clears the brain.	Most acupuncture points on the face receive fibers from the trigeminal nerve. The trigeminal nerve connects with other nerves, carrying their fibers to their respective destinations. These nerves include the facial nerve, the vagus nerve, sympathetic nerve fibers from cranial thoracic cell bodies, and parasympathetic fibers. Somato-autonomic relationships of cranial nerves and the autonomic nervous system help link somatic stimulation of points on the face with strong physiologic alterations. Some of these reflexes include: trigemino-cardiac reflexes[45], nasotrigeminal reflexes[47] and trigemino-cervical-spinal reflexes.[48,49] Nasotrigeminal afferents acting on medullary respiratory neurons might help reinstate inspiration after a period of apnea.[50] Input from trigeminal afferents may provide somatic input to the pneumotaxic center in the pons, which participates in respiratory reflexes.[51]
ST-36	Regulates the stomach and spleen, reduces digestive stagnation, redirects rebellious *Qi* downward, and drains pathogenic influences from the stomach.	Electroacupuncture at ST-36 accelerates motility and transit speed of the colon by sending afferent volleys to the nucleus tractus solitarius and activating sacral parasympathetic output through the pelvic nerve.[52] In contrast, gastric stimulation arising as a consequence of electroacupuncture at ST-36 emanates from the dorsal motor nucleus of the vagus and projects to the stomach via gastric branches.[52]
PC- 6	Regulates and tonifies the heart, clears heart fire, calms the spirit, clears the brain.	Electrical stimulation of the median nerve, which lies beneath the surface of PC-5 and PC-6, causes a long-lasting modulation of blood pressure elevations caused by visceral afferent activation. In part, this occurs through inhibition of cardiovascular neurons converging with somatic afferent neurons in the rostral ventrolateral medulla (rVLM).[53] This pathway involves opioids and the arcuate nucleus in the hypothalamus, which produces opioids. Excitatory projections from the arcuate nucleus onto the ventrolateral periaqueductal gray (vlPAG) also comprise part of the essential mechanism through which electroacupuncture at PC 5 and PC 6 inhibit reflexive increases in blood pressure following either gallbladder visceral afferent excitation or its surrogate, activation of the splanchnic nerve. Stimulation of the vlPAG results in lowering of blood pressure, while stimulation of the dorsal PAG elevates it. Stimulation of the median nerve at PC 6 stabilized blood pressure in a canine animal model of hemorrhagic hypotension.[54]

somato-somatic reflexes. Although the metaphor-based Chinese medical description of these point actions evoke vague physiologic processes, the neuroanatomic basis for these actions promotes a deeper understanding of both the point actions and connections from the peripheral to the central nervous system. This approach for three commonly employed veterinary acupuncture points is demonstrated in Table 3.

As early as the 1970's, articles began appearing in the veterinary medical literature indicating recognition of the links between acupuncture and the autonomic nervous system.[16] By the ensuing decade, recognition of the interrelationship between acupuncture and the nervous system strengthened.[17] In 2004, Kothbauer further delineated the relationships between acupuncture points and nerves in his review of steps toward anatomical verification of point locations in cattle.[9]

Inserting a needle into skin, muscle, vessel, fascia, etc., one engages and activates various afferent nerve fibers. Somatic sensory stimulation activates impulse relays in the central nervous system (CNS), which then alter processing and output. Acupuncture works by modulating activity in the central, peripheral, and autonomic nervous systems.[18-20] As such, acupuncture point innervation and the subsequent central neuronal processing help to explain the traditional applications of acupuncture points.

Neurological connections exist between acupuncture points on the body wall and sympathetic pathways in the thoracolumbar spinal cord. These offer possibilities of influencing internal organ function by stimulating paraspinal points such as the Back *Shu* points.[21] However, because of incomplete delineation of autonomic nervous pathways in most non-human species, accurate mapping of the Back *Shu* points onto the non-human spine will require further research.[21] For this reason, several authors have advocated treating several spinal segments at one time, as further reassurance that the correct levels corresponding to internal organ innervation will receive input.[22]

Acupuncture point stimulation also affects supraspinal processing. A key pathway involves the nucleus tractus solitarius (NTS). The NTS, a major visceral sensory nucleus in the brainstem, receives input from both somatic and visceral sources, including the heart, lungs, digestive tract, baroreceptors, and chemoreceptors. General and special visceral afferent fibers arising from cranial nerves III, VII, and X also converge onto the NTS.

The NTS integrates the myriad incoming signals and responds with efferent volleys sent to numerous end-organs, including the gut. The NTS alters gastric function by modulating output from the dorsal motor nucleus of the vagus (DMNV) which, together with the NTS, comprises the dorsal vagal complex (DVC).[23] The plasticity of responses generated by intimate neuronal communications between the NTS and the DMNV allow the body to closely regulate digestive and other processes through their control over widespread autonomic activities.

One group of researchers, looking to uncover the basis of channel-organ relationships, compared activity in the NTS in rats after stimulating three different acupuncture points on the face.[24] The somatic afferent projection that enters the NTS from the face arises mainly from the trigeminal nerve. The three points studied were: ST-2 (in the infraorbital foramen), SI-18 (at the intersection of lines drawn from the lateral canthus and the inferior border of the zygomatic bone), and a sham point (0.5 cm lateral to ST-2). The results showed that neuronal response rates in the NTS were nearly double for ST-2, compared to the non-acupuncture point and SI-18. Thus, all three points, linked to the trigeminal nerve, affected the NTS, but ST-2 did so most strongly.

Perhaps anatomical features of the nerves related to each of these points account for some of the differences in their responses to stimulation. That is, the trunk of the infraorbital nerve emerges from the infraorbital foramen below ST-2. SI-18 receives fibers from both the infraorbital and mandibular nerves (from the 2nd and 3rd divisions of the trigeminal nerve, respectively), but is not located over a nerve trunk. The non-acupuncture point, or sham point, receives fibers from the infraorbital nerve but is not over the trunk. That is, the nerves supplying SI-18 and the sham point were smaller in diameter than the nerve underlying ST-2. As noted above, bigger nerves near points deliver bigger effects when the points are needled.

Another study compared ST-2 stimulation with GB-14 and ST-6 in rats.[25] Because all of these points appear on the face, they all receive nerve supply from the trigeminal nerve. GB-14, above the pupil on the forehead, relates to the supraorbital nerve. ST-2 again corresponds to the infraorbital nerve as it emerges through the infraorbital foramen. ST-6, in the center of the belly of the masseter muscle, receives innervation from the auriculotemporal and masseteric nerves. Of these three, ST-2 once again demonstrated the strongest activation of the NTS, followed by ST-6 and then GB-14.

These two studies highlight the relevance and central importance of correctly transposing points from humans to non-humans, according to related neural characteristics. Not long ago, ST 2 appeared in a position that looked like its location in humans, which is right under the eye, but this is not consistent with the location of the infraorbital foramen in dogs and horses.[26] This erroneous placement persisted for almost twenty years, only to be changed in the last few years. If nerves didn't matter, why not leave it in the same topographical region as in the human? Why do a comparative neuroanatomic placement for some points and not others?

POINT SPECIFICITY IN ACUPUNCTURE

Point specificity is important. Point specificity implies nerve specificity. As noted by Tjen-A-Looi, stimulation of certain nerves engenders specific cardiovascular changes, whereas stimulation of other nerves does not cause the same effects.[27] Activation of deep, as opposed to superficial, somatic neural structures caused differential cardiovascular responses by providing more input to the rostral ventrolateral medulla (rVLM).

Some nerves, but not others, participate in particular autonomic responses. Blood pressure modulation results from cardiovascular reflexes in the rostral ventrolateral medulla, the ventrolateral

periaqueductal gray, and the arcuate nucleus of the hypothalamus. Electroacupuncture drives these reflexes when applied to some points and their respective nerves, but not others. The nerves and points that send input to the arcuate nucleus include the median nerve (PC-5 and PC-6); deep radial nerve (LI-4 – LI-11); ulnar nerve (HT-6 and HT-7); trigeminal and facial nerves (ST-2 and GB 2); deep peroneal nerve (ST-36 and ST 37); and the tibial nerve (SP-6 – SP-9). In contrast, points overlying the superficial radial nerve (LI-6 – LI-7) and the superficial peroneal nerve (GB-37 – GB-39) send little to no input to the arcuate nucleus.[28]

NEUROANATOMIC RELATIONSHIPS

Decades ago, researchers quantified the number of points in humans related to either cranial or spinal nerves, and found almost a complete association (323/324 points studied) between the two.[29] This is despite the fact that some refute the idea that acupuncture points relate to nerves or blood vessels, looking instead for an invisible linking phenomenon common to both plants and animals.[30] In the mid-1980's, anatomist and acupuncturist Houchi Dung, PhD, wrote extensively on the nerve-acupuncture point relationships throughout the body.[31-36] Dung identified ten features of peripheral sensory nerves associated with the formation of acupuncture points.[37] These included:

1. **Nerve size:** Larger nerves tend to form more important acupuncture points than smaller ones.
2. **Nerve depth:** Acupuncture points tend to occur where deep nerves rise to more superficial levels.
3. **Emergence of nerves through deep fascia:** When nerves penetrate fascial layers, they can be affected by tension in the fascia; this is likely one of the reasons that acupuncture points are associated with these zones.
4. **Nerve passage through bone foramina:** Sites where foramina of the skull transmit cranial nerves qualify as acupuncture points.
5. **Neuromuscular attachments, or motor points:** Many acupuncture points arise at the site where a muscular nerve branch attaches to and enters a muscle.[37] The nerve branch may be carrying motor, sensory, and sympathetic nerve fibers.
6. **Concomitant arteries and veins accompanying nerve trunks:** These vessels travel with the nerves, often in neurovascular bundles. Since acupuncture began as a bloodletting therapy, the tight relationship of vessels, nerves, and acupuncture points brings no surprise.
7. **Fiber types in nerves:** Acupuncture points which contain three fiber types (sensory, postganglionic sympathetic, and larger efferent (motor)) are often more tender than those with only the first two.
8. **Nerve bifurcations:** These sites include places where nerve trunks divide into smaller nerves, predominantly in the distal extremities. From a comparative anatomical acupuncture perspective, finding equivalent locations in distal, non-human limbs can pose insurmountable challenges because of missing digits, which may require omitting certain human points from the equine acupuncture atlas.
9. **High-sensitivity connective structures:** Some connective tissue components possess abundant afferent innervation. As such, they readily convey information regarding stretching and pressure. Examples of these structures include tendons, retinacula, thick sheets of fascia, joint capsules, and collateral ligaments. Acupuncture points often occur near these entities.
10. **Cranial sutures:** The Governing Vessel illustrates the close relationship between acupuncture points and cranial sutures. The Governing Vessel relates to venous structures in the head and body. On much of the human head, it overlies the sagittal venous sinus.[39]

By accurately defining nerves and nerve characteristics typical of human acupuncture points, researchers in veterinary acupuncture anatomy are well-armed to move forward with a systematic re-examination of the entire veterinary acupuncture transpositional point system, in order to improve needling accuracy and treatment outcomes.

VISION FOR THE FUTURE

As authors of a recent systematic review on veterinary acupuncture effectiveness stated, "Some encouraging data do exist that warrant further investigation in independent rigorous trials".[40] However, most agree that the quality of comparative acupuncture research needs improvement.[40, 41] Researchers have isolated three main issues that are inhibiting the advancement of acupuncture research; one of these is the "gap" in results reported between animal and human studies.[42] The quality and reproducibility of the research will both improve once a systematic delineation of all veterinary acupuncture points takes place. Since acupuncture works through neuromodulation and because structure and function are so intimately related, precise neuromodulation depends on anatomically accurate

point location.

Research on the anatomy and histology of veterinary acupuncture points is underway around the globe.[43] Work at the Colorado State University College of Veterinary Medicine and Biomedical Sciences has begun to first completely identify all of the key structures inherent at each human point, and then determine whether a comparable location exists in other species

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Canine Transpositional Acupoints. Chapter Â· January 2008 with 22 Reads. How we measure 'reads'.Â Six Basic Acupuncture Methods Five General Principles To Select Acupuncture PointsEight Methods For Deficiency PatternEight Methods For ExcessNumber Of Points SelectedDuration Of Acupuncture TreatmentFrequency Of Acupuncture Treatment SessionsPreparation For AcupuncturePrecautions And ContraindicationsManagement Of Possible Accidents. Presentation on theme: "Commonly Used Canine Transpositional Acupuncture Points"â€” Presentation transcript: 1 Commonly Used Canine Transpositional Acupuncture Points Dr. Carla Leon Assisted by Dr. Lisa Travisanello, Dr. Cheryl Chrisman, Solo, Brittany and Hurricane Frances 2004. 2 Chinese Inch=Cun The width of the last rib is 1 cun. 3 Medial Forelimb Anatomy Review.Â 35 LIV-14 In a depression at the costocondral junction near the mammary line at the 6th intercostal space Front Mu alarm point for the Liver Hepatic disorders, mastitis, pleuritis, chest pain, muscle pain. Download ppt "Commonly Used Canine Transpositional Acupuncture Points". Similar presentations. Acupuncture points are seen as places where nerves, muscles, and connective tissue can be stimulated. The stimulation increases blood flow, while at the same time triggering the activity of the bodyâ€™s natural painkillers. It is difficult to set up investigations using proper scientific controls, because of the invasive nature of acupuncture. In a clinical study, a control group would have to undergo sham treatment, or a placebo, for results to be compared with those of genuine acupuncture.Â The number of treatments needed depend on the individual. A person with a chronic condition may need one to two treatments a week over several months. An acute problem normally improves after 8 to 12 sessions.