EQUINE CHIROPRACTIC OVERVIEW

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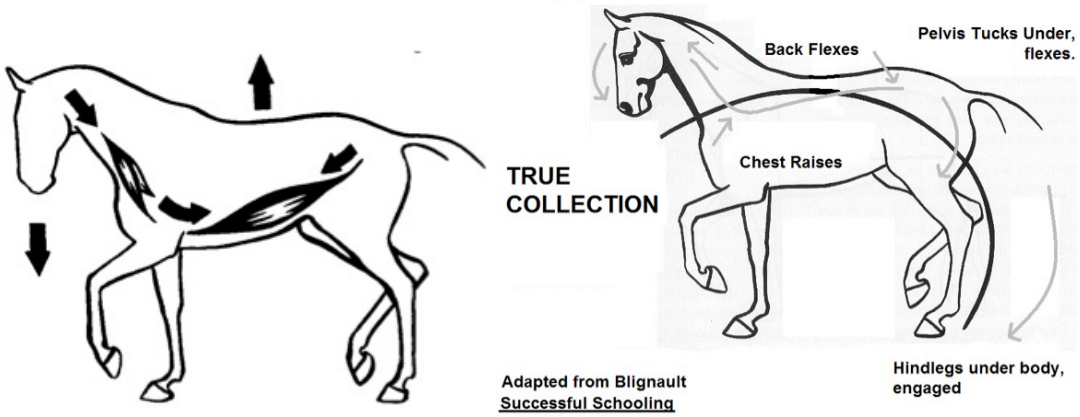
An awareness of the role of chiropractic in musculoskeletal evaluation and treatment for the equine athlete will enable you to achieve optimal soundness for horses in your care. With your comprehensive training regarding the conventional examination of horses for lameness as a foundation, I would like for you to now consider examination of the axial skeleton and upper body as a natural extension of your approach to evaluating soundness in horses.

Biomechanical Considerations:
The quadruped spine and pelvis can be viewed as the drive train of an automobile. The sacrum and pelvis work as the engine, creating energy for movement. The lumbosacral junction functions as the transmission, converting that energy into forward motion. The spine works as the drive shaft, transmitting the power and movement forward.

The "Bow and String Theory" offers a biomechanical explanation for how potential energy is generated and stored in the spine and released as kinetic energy during locomotion. The "bow" is the rigid component consisting of the bony spinal segments and the ligaments that surround them. The "string" is consists of the dorsal spinal or epaxial muscles plus the ventral hypaxial muscles such as the longuscapitus, longuscolli, psoas, and the abdominal muscles such as the abdominal obliques, transverse abdominus, rectus abdominus, and the caudal ventral cervical flexors such as the scalenus.

The rigidity of the bow is inherent in its bony architecture and vertebral spinal joints along with the high density of intimately attached intrinsic ligaments. When the ventral muscles contract, they act as strings that are drawn by an archer to flex and cock the bow, storing potential energy in the bow / spine. When the mechanism is released unimpeded, all of the potential energy is released as kinetic energy creating net positive gain in energy required for engagement / collection and movement. Any impedance in cocking or release of the mechanism will result in reduced net gain and adversely affect movement.[1]



History of Veterinary Chiropractic:
Although theory and technique of spinal manipulation had its origin in ancient civilizations, Daniel David Palmer founded chiropracticin 1895. In 1897, he established the Palmar Infirmary and Chiropractic Institute in Davenport, Iowa. D. D. Palmer believed strongly that chiropractic was as useful to animals as humans. Even though he was genuinely interested in animal health and well-

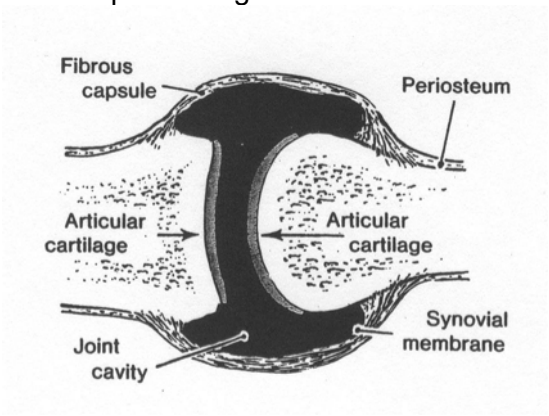
being, he opened an animal treatment clinic at the Institute to disprove accusations of the placebo effect in chiropractic treatment. Students completing rotations in the animal clinic were awarded degrees in Doctor of Chiropractic Veterinary (DCV). The animal clinic closed before WW II.

In 1972, Mr. John Timoney began a human chiropractic school in England. Treatment of animals was a normal part of the curriculum and clinic. Currently, there is aMcTimoney Animal Chiropractic Program open to professionals and non-professionals in the UK.

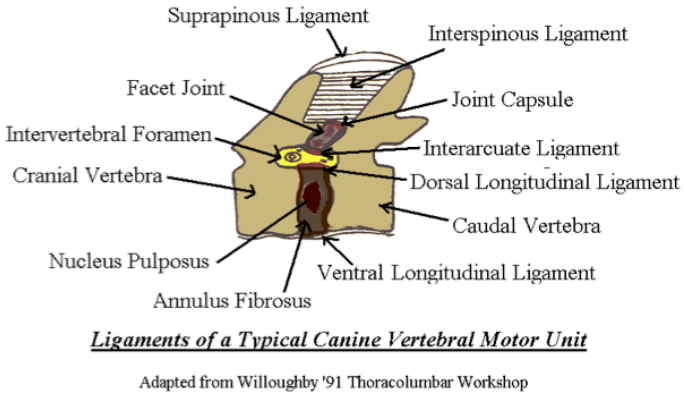
Modern animal chiropractic was founded with a vision that animal chiropractic deserves a place in animal health care. This concept was developed largely because of the work of Sharon Willoughby, who held veterinary and chiropractic degrees from Michigan State University and Palmer College of Chiropractic in Davenport, Iowa, respectively. Shortly after receiving a Doctor of Chiropractic in 1986, she decided to dedicate all her energy to the development of better animal chiropractic care and education. Dr. Willoughby and colleagues founded a school referred to as American Veterinary Chiropractic Association (AVCA) in 1989, in Port Byron, Illinois. All of the curricula in today's chiropractic schools can be traced back to Dr. Willoughby. In 2000, the school name was changed to Options for Animals.Shortly after, she sold the school to colleagues and returned to private practice. The school later moved to Wellsville, Kansas.Today there are three schools in the United States that are certified by the American Veterinary Chiropractic Association (AVCA) and International Veterinary Chiropractic Association (IVCA)(see footnotes). Other certified schools are located in Canada, UK, and Germany.[1]

Chiropractic Fundamentals and Concepts:
As one of the manual therapy modalities, chiropractic is concerned with the diagnosis, treatment, and prevention of disorders of the musculoskeletal system and the effects of these disorders on the nervous system in general health.[2] Chiropractic uses manually applied, high velocity, low amplitude forces (i.e., adjustments) to specific joints or anatomical sites, to induce therapeutic responses in articulations, muscle function, and neurological reflexes.[3]The goal of chiropractic is to ensure smooth, coordinated movement of all spinal segments to optimize spinal jointneuromuscular function.

Motion palpation is the chiropractor's most important diagnostic "tool". **Motion units** are defined as a functional unit made up of two adjacent articulating surfaces, the connecting tissues binding them, and all tissues between them. A **vertebral motion unit** consists of two adjacent vertebrae and all the structures that connect and are in between them. The **range of motion (ROM)** in a motion unit is determined by applying gradually increasingmanual pressure to spinal joints or adjacentanatomical sitesat specific angles.



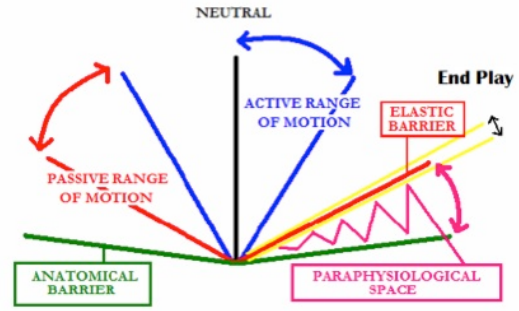
Simple Motion Unit



Vertebral Motion Unit

The normal range of motion of a motion unit can be divided into several components. **Active ROM** is the motion unit movement in one plane resulting from voluntary muscle contraction, while **passive**

ROMis the additional movement possible elicited by an external force. The combined active plus passive ROM is sometimes referred to as the **physiologicalzone**. The **elastic barrier** is detected at the end of the active and passive ROM as defined by peri-articular ligaments and connective tissue and referred to as the **end feel** of the motion unit. Moving the joint through the passive ROM, an increase in resistance is palpated as the elastic barrier. The **anatomical barrier** is the absolute end of the ROM and additional movement will compromise anatomical structures. Between the elastic and anatomical barriers is a theoretical space referred to as the **paraphysiological space**.The paraphysiological space is very small (millimeters at best) and where a chiropractic adjustment is executed. Development of a sense of the end feel is one of the most important skills in diagnosing abnormal motion unit movement.



Dorsal facet jointsare gliding synovial joints(i.e., zygapophyseal joints) formed by the caudal articular processes of cranial vertebrae and cranial processes of caudal vertebrae. Orientation of the angle or plane of facet joints varies with reference to the spinal axis in different spinal regions. Knowledge of their orientation is key to chiropractic adjustments that must be performed in the plane of the joint to avoid traumatizing the joint. The angle of mid-cervical facet joints is 45^0-45^0-45^0, T-1 to T-12 facets is 45^0 in the coronal plane, and lumbar facets have a parasagittal orientation, as examples. In transition zones between spinal regions (i.e. cervical > thoracic > lumbar), facet joint angles gradually change their orientation. The vertebral facet joint angles determine the characteristic movement of not only each spinal segment, but also collective dynamic biomechanics in a region or the spine as a whole. Taking this concept a little further, c**oupled motion** occurs where there is consistent coupling of motion between vertebrae within a spinal region (e.g., lumbar lateral flexion cannot occur without lumbar axial rotation, and visa versa).[1]

Joint **mobilization** and **manipulation**aremanual therapiesused for restoration of joint and musculoskeletal function. While mobilization is used within the active and passive ROM, joint manipulationoccurs within the paraphysiologic space (i.e., chiropractic adjustment). Manipulation in people relieved adjacent spontaneous myoelectrical activity immediately, whereas mobilization did not.[44]

Joint manipulation often induces a palpable release or movement of restricted articulations of motion units. Occasionally, an audible crack or pop may be heard during the chiropractic treatment as the applied force overcomes the elastic barrier of joint resistance,[5,6]causing cavitation in the joint fluid.[7] An audible sound is not a requirement for a successful adjustment.[8]

Pathophysiology of vertebral segment dysfunction

The **vertebral subluxation complex (VSC)** is a theoretical model that encompasses the complex mechanical and biochemical relationships of injured nervous, muscular, articular, ligamentous, vascular, and connective tissues.[9] It represents vertebral segment dysfunction and as a subluxationin the chiropractic sense is characterized by:

1. Asymmetrical or loss of normal joint motion

2. Diminished pain thresholds to pressure in adjacent paraspinal tissues or osseous structures
3. Abnormal paraspinal muscle tension[4]

The VSC is at the core of chiropractic theory and its detection and correction is central to chiropractic practice. It has caused much misunderstanding and controversy between the chiropractic profession and medical and veterinary professions. The medical and veterinary definition of subluxation is an orthopedic lesion where there is a partial or incomplete joint dislocation. Chiropractors do not treat true pathological subluxations. A chiropractic vertebral subluxation is a decreased or abnormal range of motion of a facet joint where there is no disruption of articular surfaces. While there are different forms of manual therapies and joint mobilization techniques, chiropractors are the only health care practitioners trained to diagnose and correct a VSC.[8]

Vertebral subluxation complexes are diagnosed by manually testing (i.e., motioning) every motion unit of the patient. Once diagnosed, the VSC is corrected by a chiropractic manipulation / adjustment consisting of a high velocity, low amplitude (HVLA) manual thrust at a specific contact point and line of correction (vector) with the intent of freeing the restricted joint and improving the ROM of the motion unit. The goal of chiropractic treatment is to reduce pain and muscle hypertonicity, restore joint motion, and normalize neurologic reflexes.[3]

The intervertebral foramen (IVF) and its contents are key to appreciating how abnormal motion unit or facet joint mobility (VSC) can affect normal neurophysiology. Boundaries or the IVF are the cranial and caudal vertebral notches, ligamentum flavum, facet joint capsule, and intervertebral disc. Spinal nerves with their afferent sensory and efferent motor branches and dorsal root ganglionlie in the IVFsurrounded by extensions of the dura mater called dural sleeves. Additionally, the dural sleeves contain an artery, vein, lymphatic vessels, nerves, and ligaments. Beyond the IVF, spinal nerves are covered by the epineurium and perineurium.[8]

The mechanisms by which chiropractic therapy produces a therapeutic effect are not completely understood.Altered muscle movement patterns are learned by the nervous system to address pain and discomfort. Chiropractic treatment is thought to affect spinal input of mechanoreceptors (i.e., Muscle Spindle Cells, Golgi Tendon Organs, and joint capsule pressure receptors) to induce reflex inhibition of pain and reflex muscle relaxation and to change abnormal muscle movement patterns.[9,10] Chiropractic adjustments may reduce musculoskeletal pain by stimulating nociceptive reflexes and release of neuropeptides.[4,5,10] Chiropractic treatment of VSC's may release compression of nerve roots and venous and lymphatic stasiswithin the IVF and restore local normal neurophysiology.Spinal nerve rootconduction blocks and altered venous blood flow were seen with significantly lower pressure than for peripheral nerves, demonstrating the greater sensitivity of spinal nerve roots to pressure and evidence for a role of compression in VSC pathophysiology.[8]

<u>Equine Chiropractic Research</u>

Recent studies in horses have addressed the ability of chiropractic technique to induce spinal movement and relieve pain. A pilot study with horses instrumented with transducers attached to Steinman pins implanted into the dorsal spinous processes of adjacent thoracolumbar vertebrae showed that properly applied chiropractic adjustment forcesproduced substantial spinal motion beyond the normal range of segmental motion that occurs during locomotion.[11]Pressure algometry was used to measure mechanical nociceptive thresholds (MNTs) in the thoracolumbar region of horses to determine if chiropractic treatment can reduce back pain measured as increased MNTs.[12,13] Application of instrument-assisted HVLA (i.e., Activator) thrusts at sites from T-13 to L-6 produced a measurable increase in MNTs in 10 out of 10 vertebral locations treated; however, only 7 of 10 were statistically significant compared to controls.[12]When the effects of chiropractic treatment with an Activator, message therapy, and phenylbutazone were compared on Day 7 of the study (as measured with an Algometer) in horses not exhibiting back pain, MNTs increased by 27% in the chiropractic

group, 12% in the message group, and 8% in the phenylbutazone group, with less than 1% in control groups.[13]

Additional studies investigated the effects of chiropractic techniques on spinal flexibility and longissimus muscle hypertonicity.[14,15]In an experimentally induced back pain model, manual chiropractic treatment induced a 15% increase in vertical displacement and a 20% increase in applied force compared to controls, indicative of increased spinal flexibility and increased tolerance to applied pressure.[14]Significant decreases were recorded in muscle tone and electromyographic (EMG) activity within the longissimus muscle immediately after spinal manipulation or reflex inhibition therapy compared to the control group.[15]

Chiropractic care compliments traditional lameness evaluation and treatment:
Chiropractic evaluation and treatment are not a substitute for a thorough lameness diagnostic evaluation, because many horses have musculoskeletal issues that are identified and managed with traditional approaches. Most practicing equine veterinarians have not been educated or experienced in procedures to perform a thorough functional biomechanical evaluation of the equine spinal column. Consequently, horses with lameness issues not diagnosed readily using traditional methods, or with suspected concurrent neck or back pain, are good candidates for referral for chiropractic evaluation.[3]Chiropractic care provides additional diagnostic and therapeutic options that are currently not available in veterinary medicine.

Lameness in the distal limb(s) is often associated with compensatory pain or stiffness in the spinal column. After the primary lameness in the distal limb(s) has been diagnosed and successfully treated using traditional approaches, it is logical to have a chiropractic evaluation and treatment of the spine to restore normal spinal mobilitywithout pain or muscle spasms before the horse resumes full work. While the traditionalapproach is used to eliminate other, more common causes of lameness or neurological disorders, chiropractic assessment focuses on evaluating and localizing segmental vertebral dysfunction characterized by localized pain, muscle hypertonicity, and reduced joint motion.[9]

Clinical indications for chiropractic evaluation:
More common indications for equine chiropractic evaluation are acute or chronic neck, back, or pelvic pain, localized or regional joint stiffness, poor performance, and an altered gait or body posture in motion that is not associated with overt lameness. Additionally, discomfort with saddle placement or tightening of girth, change in attitude or behavior when ridden, difficulty turning in one direction, muscle mass or pelvic asymmetry, and altered head or tail carriage may be presenting complaints. Any horse that experiences a traumatic incident or injury, horses that are hoisted by their feet for surgery, horses that have other than an ideal recovery from anesthesia, ormares that foal (especially with a dystocia +/- general anesthesia) would likely benefit from a chiropractic evaluation.

Chiropractic Technique:
Motion palpation, as the chiropractor's most important diagnostic tool, is used to examine each vertebral segment for loss of normal motion and resistance to induced motion. Knowledge of spinal facet joint plane variation in different spinal regions is key to safe, effective assessment of motion unit movement.Manual pressure iscarefully applied at specific segmental contact points known to safely move adjacent articulations when applied gentlyin a line of correction corresponding to the plane of the facet angle. The examiner must concentrate as they move the joint or motion unitthrough the active and passive ROM's (physiological zone)to identify the elastic barrier or end feel.This feeling is also referred to as **bringing the joint to tension** and marks the end of physiological joint movement. A resistant or abnormal end ROM is detectable earlier in passive movementpalpation and has an abrupt, restrictive end feel compared with normal joint end feel. Vertebral segments with abnormal movement may or may not be associated with localized pain or muscle hypertonicitywhen examined.[33] Joint movement beyond the anatomical barrier is possible only when there is ligamentous or joint capsule disruption and subluxation (i.e, hypermobile).

Motion palpation is repeated for each spinal segment / motion unit to identify abnormal movement. Abnormal movement can be determined in flexion and extension, right and left lateral flexion, and rotation depending on the region evaluated. On a regional basis, change in theelastic barrier is identifiedin cervical vertebrae in coupled lateral flexion and rotation. In thoracic vertebrae caudal to the withers and lumbar vertebrae, abnormal motion is assessed in lateral bending and flexion and extension with the examiner beside the horse placing one hand adjacent to the dorsal spinous process to be evaluated. The other hand is cupped around the tail head and used to intermittently,gently pull laterally to generate smooth, rhythmic undulations of the caudal spinal column. Evaluation of flexion and extension of vertebrae in the same region requires the examiner to place their hand on the dorsal spinous process and apply dorsal-to-ventral pressure while standing on an elevated surface. Lateral bending is maximalat the mid-thoracic region due tofacet angulation while flexion and extension are minimal. Progressing caudally, flexion and extension gradually increase and become maximal in the lumbosacral motion unit. The sacroiliac joint is evaluated for abnormal movement or pain by placing one hand on the tuber sacrale and simultaneously applying dorsal-to-ventral pressure on the ipsilateral tuber coxa, or applying pressure directly to the contralateral tuber sacrale at an angle corresponding to the sacroiliac joint angle while on an elevated surface.Additional spinal motion units not discussed here are the atlanto-occipital, atlanto-axial, cervical, sacrum, and coccygeal. There are also techniques for motion palpation of rib articulations, the temporomandibular joint, and other extremity joints.Because restricted motion units or articulations (VSC's) are immediately corrected using a HVLAthrust in the appropriate line of correction as they are identified, a thorough chiropractic evaluation and treatment can be completed in 15 to 20 minutes in a cooperative horse. If not on the first visit, in subsequent visits, most horses are compliant and seem to invite the chiropractor's examination because the experience should be pleasant for the horse. During chiropractic treatment, many horses show signs of content or relief by yawning, lowering their head and eyelids as though sedated, chewing, audible exhaling, or looking back.

Osteopathic vs. Chiropractic Technique:
Some osteopathic treatment employs a HVLA thrust to selectedrestricted joints or motion units similar to chiropractic technique presented here. More commonly, osteopathic approaches are characterized by mobilization of multiple joints simultaneously referred to as "long-lever" techniques. Once the osteopathic practitioner detects resistance during mobilizationof the neck or leg for example, the movement is sharply pushed or pulled to release the resistance in the joint(s) that might be included in the "lever". Osteopaths also use indirect techniques. They are referred to as indirect because, rather than pushing through a restriction, they rely on moving a joint in the opposite direction into a position of dysfunction and holding the position until tissues around the joint relax.[16]These "long-lever" techniques are not used in chiropractic practice.

Chiropractic Care:
Chiropractic evaluation and treatment addresses mechanically related issues of the musculoskeletal and nervous system and provides a conservative approach for treatment and prevention in horses with back problems.[3]Chiropractic manipulations are applied to specific areas of vertebral segment dysfunction (VSC's) to affect joint, muscle, and nerve function via mechanical and biochemical mechanisms.[4]

Effective joint manipulation is difficult to apply to a nervous, tense horse because muscle relaxation is important fordetection of the elastic barrier / end feel. Chiropractic treatments are generally done without sedation, but a lip chain or twitch might be used for restraint in some uncooperative horses. Environmental distractions such as feeding time in the stable, increased stable activity, unruly horse in the adjacent stall, or horses being turned out during the examination are counterproductive to effective chiropractic evaluation.

Untrained professionals orlay “chiropractors” who do not have a thorough understanding of joint physiology, vertebral anatomy, or chiropractic principles often resort to overly aggressive and forceful means of applying an external force (i.e., mallets, boards, etc).[3] These methods can injure horses and cause permanent problems or be life threatening in some cases.

At the time of chiropractic treatment, typically there is an immediate decrease in pain and increase in segmental vertebral motion. Most horses experience segmental muscle relaxation, but acupuncture, stretching, and message can be used as adjunctive therapy to further resolve remaining muscle hypertrophy. Conditions with an acute onset generally respond quickly, while chronic conditions often require multiple treatments and rehabilitation. Horses that acquire acute, painful conditions or experience spinal trauma may be more easily examined and treated after anti-inflammatory medication, physiotherapy (i.e., ice, electro-stem, etc.), or a period of rest. Horses that do not respond completely to an initial treatment for acute pain or muscle hypertonicity, often require two or three treatments at an interval of one to three weeks for total resolution of their problem. Horses with ongoing, chronic cervical or back stiffness might require chiropractic evaluation and treatment monthly for several months or longer to ensure maintenance of spinal health. Some owners or trainers strongly feel chiropractic evaluation and treatment several days prior to competition ensures their horses will be in optimal condition. While research regarding a potential synergistic effect from combining chiropractic and acupuncture or message therapy is lacking, some practitioners, owners, and trainers feel a positive relationship is seen by combiningchiropractic with these therapeutic modalities.[3]

Chiropractic Contraindications:
Chiropractic treatment is contraindicated for obvious pathological conditions, fractures, infections, neoplasia, metabolic and non-mechanical problems. Horses with medical or surgical conditions should be treated with conventional veterinary medicine; however, there is often a role for chiropractic in rehabilitation by assisting restoration of normal neuromuscular and musculoskeletal function.

Chiropractic is contraindicated for acute episodes of pain associated with soft tissue injury, osteoarthritis, impinged dorsal spinous processes, and joint hypermobility (joint subluxation and dislocation). Spinal cord compression caused by static or dynamic cervical lesions caused by cervical vertebral instability are contraindications to cervical manipulation. However, chiropractic treatment of adjacent compensatoryhypomobile vertebrae (VSC’s) may improve joint motion and reduce cord compression in the affected spinal segments.[3]

Complications:
Following properly applied chiropractic treatment, potential adverse effects such as transient stiffness or worsening of the condition are not typical, but may develop gradually in 6 to 12 hours after treatment. These adverse clinical signs generally dissipate without medication. If there is evidence of acute increased pain, decreased cervical mobility, or lameness, a re-evaluation and conventional medical and physical therapy should be instituted. Depending on the severity of clinical signs and assessment, referral for more extensive diagnostics may be indicated.

More severe complications from improperly applied force or manipulation by untrained or lay “chiropractors” can include ligament disruption, dorsal facet inflammation, bruised muscles, fractures, joint luxation, and paralysis. The presence of undiagnosed pathologyfurther contributes to the development of serious complications.

Summary:

1. Chiropractic evaluation and care does not replace conventional veterinary medicine, but can have a complimentaryrole in achievingan optimal clinical outcome.

2. Chiropractic care provides additional diagnostic and therapeutic options that are currently not available in veterinary medicine.

3. Chiropractic care addresses mechanically related issues of the musculoskeletal and nervous system and provides a conservative approach for treatment and prevention of spinal problems in horses.

4. While motion palpation is the chiropractor's most important diagnostic tool, detection of the end feel or elastic barrier is the most important skill required for diagnosis of abnormal motion unit movement or vertebral subluxation complexes.

5. The paraphysiological space is where a chiropractic adjustment is executed.

6. The VSC is at the core of chiropractic theory and its detection and correction is central to chiropractic practice.

7. Osteopathic "long-lever" techniques are not used in chiropractic practice.

8. Only human chiropractors (D.C.'s) and veterinarians trained in animal chiropractic theory and skills and graduating from certified animal chiropractic schools should treat animals with chiropractic. It is illegal for lay, untrained, non-professionals practicing "chiropractic" on animals. They should be reported to state veterinary board authorities.

Footnotes:

Certified chiropractic schools in the United States:
The following are the only chiropractic colleges recognized and certified by the American Veterinary Chiropractic Association (AVCA) and the International Veterinary Chiropractic Association (IVCA):

Options for Animals College of Animal Chiropractic
Wellsville, Kansas
Phone: 309-658-2920
Fax: 678-721-2523
Email: Options4animals@aol.com
Web: www.animalchiro.com

Parker University
Parker College of Chiropractic
Department of Continuing Education
Dallas, Texas
800-266-4723
www.parkernanimalchiro.com

Healing Oasis Wellness Center
Sturtevant, Wisconsin
Canada
Phone: 866-203-7584 (Toll Free)
Email: contact@healingoasis.edu
Web: www.healingoasis.edu

Contact information for Dr. Dan Hawkins and Dr. Marilyn Maler:
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