

# Using acupuncture to treat pain in horses



**Dietrich Graf von Schweinitz** qualified from the University of Georgia, USA, in 1982. After a few years practising in Maryland he moved to the UK and founded Southern Hills Equine in Guildford. In 1998 he certified in acupuncture through the International Veterinary Acupuncture Society. He currently runs a referral acupuncture practice and is the education director for the Association of British Veterinary Acupuncturists.

**Dietrich Graf von Schweinitz**

**Interest in the use of acupuncture in people and in animals continues to grow, both from the general public and from academic institutions, including many leading western medical and veterinary teaching hospitals. This is despite ongoing debate regarding the traditional concepts of acupuncture and their translations versus a western medical approach centred on the principles of evidence-based medicine (EBM). This article focuses on the EBM aspects of acupuncture and how it works physiologically, and the use of acupuncture for pain management.**

THERE is a growing understanding of the physiological responses to acupuncture, due to advances in neuroscience and pain management. The mechanisms of this treatment go far beyond the upregulation of endogenous opioids, a process discovered in the 1970s. Most recently, the study of responses to acupuncture in people during functional magnetic resonance imaging (fMRI) of the brain has revealed very profound changes in the functional connectivity of neural structures involved in homeostasis (Santiago and others 2016). The ancient Chinese recognised and used phenomena we understand as viscerosomatic and somato-visceral reflexes, spinal segmental relevance to organs, the importance of balance between parasympathetic and sympathetic functions (encompassed in Yin and Yang concepts), and the connection between emotions and physical health.

## Acupuncture as part of integrative veterinary medicine

An article recently published in the *Open Veterinary Journal* explored the current involvement of veterinary colleges in the USA in complementary and alternative medicine (CAM), and proposed consensus guidelines for an integrative veterinary medicine (IVM) curriculum within veterinary colleges (Memon and others 2016). The authors of this study undertook a survey of American Veterinary Medical Association-accredited veterinary colleges and found that 16 of the 34 responding colleges offered a CAM course encompassing acupuncture, physical rehabilitation and hydrotherapy, the modalities most frequently administered as part of a multimodal approach to musculoskeletal and neurological diseases. As with the human medical colleges' involvement in CAM, there is widespread concern that any veterinary CAM teaching must follow the same evidence-based medicine (EBM) criteria as for conventional medicine and surgery.

There is still significant debate over the veracity of the content of courses offered by the various veterinary acupuncture associations, especially with regard to the emphasis on the significance of historical use of, and relative importance in applying, the Asian or traditional Chinese medicine (TCM) philosophies to the treatment protocols. Some TCM enthusiasts dismiss a scientific approach to acupuncture, preferring the 'energy medicine' paradigms. This has brought about a need to distinguish the modern medical approach expressed as 'western medical acu-

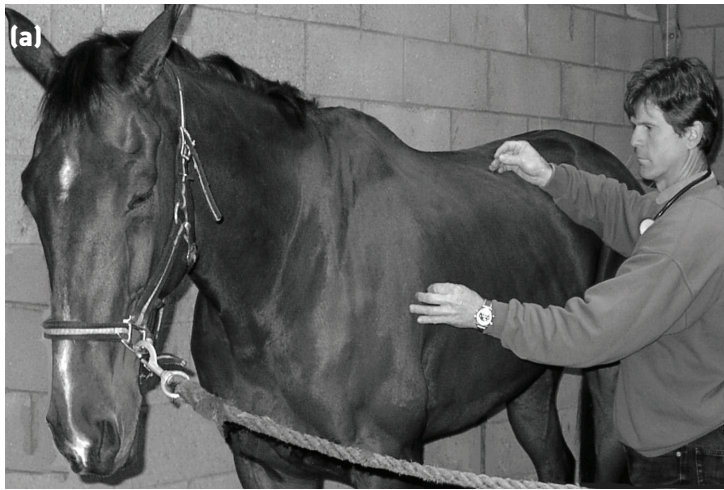
puncture: a therapeutic modality involving the insertion of fine needles'. This is an adaptation of Chinese acupuncture using current knowledge of anatomy, physiology and pathology, and the principles of EBM (White and others 2009). The methodology of acupuncture is ever changing, along with the development of science and technology (Han 2011). Clearly, it is important for proponents of acupuncture to give priority to the emerging scientific findings of acupuncture over any attachment to the historical background. The Association of British Veterinary Acupuncturists (ABVA), founded in 1987, takes this approach, as promoted by its founder, the late John Nicol.

## How does acupuncture work?

The advances in neuroscience continue to provide increasing understanding of chronic disease mechanisms, as well as evidence of positive physiological effects from acupuncture. To appreciate the uses of acupuncture, one must understand at least some of the physiology involved. During the 1970s, research pointed to acupuncture-induced upregulation of endogenous opioid release in the central nervous system as a mechanism for acupuncture analgesia. Since then, many other effects have been discovered, including the serotonergic descending inhibition mechanism, local opioid receptor upregulation, local release of adenosine and other factors that dampen the local 'inflammatory soup', and suppression of *C-fos* expression in the spinal cord associated with central wind-up.

Research exploring the acupuncture 'de qi', or needle grasp effect, has demonstrated the role of fascia and loose connective tissue in acupuncture, which may explain the 'channel or meridian' phenomena described in early Chinese medical texts (Langevin and others 2002). De qi is considered to be a central element to the therapeutic effects of acupuncture. In people it is associated with a range of peculiar sensations (aching, soreness, fullness, numbness, tingling, warmth, coolness), while the acupuncturist simultaneously feels a 'needle grasp' during needle manipulation (ie, they feel increased resistance to continued needle manipulation). We can only speculate on an animal's experience of de qi, but the acupuncturist can detect the needle grasp caused by collagen winding on the needle. Common associated observations in horses include licking and chewing, and a sedated appearance (Fig 1).

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**Fig 1: Sedated appearance (a) during and (b) after needle manipulation in an acupuncture treatment. Acupuncture points used often include local and distant, segmental and non-segmental, and tender points**

One of the most important research findings has come from the use of fMRI of the human brain in healthy volunteers and diseased patients during acupuncture. This work has demonstrated the importance of the limbic system in disease states and in acupuncture responses, particularly with regards to the de qi sensations. Three major parts of the limbic system include the thalamus (detecting and relaying information from the senses), the hypothalamus (regulating autonomic, respiration, metabolism and endocrine functions), and the amygdala (response to smell, dealing with fear, storing memories and sexual arousal). An additional brain system has been identified through the fMRI studies and has been named the default mode network (DMN), which is intimately connected with the limbic system (Lu and others 2012). By considering the impact of excessive stress and chronic pain on the limbic responses, one quickly realises the knock-on effects on key homeostatic mechanisms.

Resting fMRI in male adolescents with persistent antisocial and aggressive behaviour, and in patients with chronic depression and chronic pain, shows decreased functional connectivity in the DMN correlated to social cognition, as well as perceptual network systems (Lu and others 2015). The intensity of chronic pain is highly correlated with abnormal neuroplasticity, causing changes in the functional connectivity of brain areas. Acupuncture restores this functional connectivity and thereby promotes homeostasis (Egorova and others 2015). A common use of veterinary acupuncture is in resolving aggressive behaviours and restoring signs of wellbeing. Horse owners frequently report that their horse has become a 'better animal' following acupuncture.

The fMRI studies show that de qi responses cause deactivations in the limbic system and restore functional connectivity with the DMN, and these brain activity patterns are associated with chronic pain relief (Egorova and others 2015). The usual animal response to acupuncture of apparent tranquilisation is an example of the limbic and DMN response (Fig 1). Studies of fMRI in primates, rodents and rabbits have revealed comparable functional connectivity in networks, including the hippocampus, DMN, cerebellum, thalamus, and visual, somatosensory and parietal cortices (Schroeder and others 2016).

## Managing pain with acupuncture

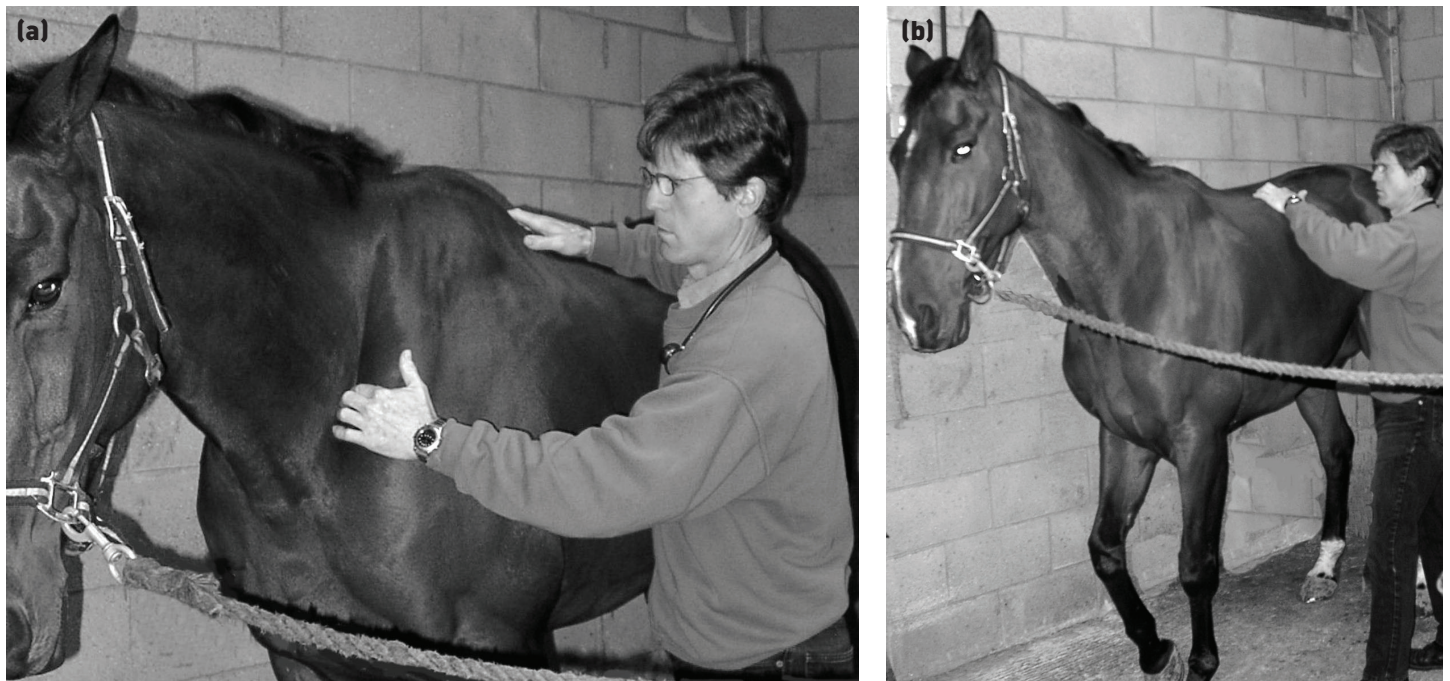
The use of acupuncture has most commonly been considered a treatment option for pain, and most research in acupuncture has focused on this aspect. There is no greater obligation on the veterinarian than to relieve pain and suffering of animals to one's best ability. A major challenge is the difficulty in identifying signs of chronic pain in horses, and safely and effectively treating such conditions. As such, there is growing interest in improving the detection and treatment of chronic pain. Identification often requires close attention to relatively subtle signs in behaviour, posture and facial expression. Rochais and others (2016) studied the attentional engagement of stabled riding horses with their environment. They found that horses that suffered less with back pain monitored and paid more attention to their surroundings.

Other research in this area includes an equine facial action coding system, which is an observational tool for identifying and recording facial movements in horses, and objectively scoring their facial behaviour (Wathan and others 2015) against a grade of pain.

A much greater focus on equine neck and back pain issues, and an increased understanding of chronic pain mechanisms, has emerged in recent years. The diagnosis is often contentious as the diagnostic techniques available are limited in value, and therefore treatments may be based on incorrect premises due to false positive or false negative results. A recent review article on the evaluation of poor performance in sport horses discusses the limits of investigative procedures and lack of a standard protocol in these evaluations (Dyson 2016). Acupuncture in difficult to diagnose poor performance cases is helpful due to the holistic approach, including the acupoint palpation. This involves a methodical head-to-toe exploration and identifies the affected spinal segments to focus on, while the treatment then has a global wellbeing effect (Fig 2).

By nature, animal owners and veterinarians are inclined to believe that chronic pain in horses must be associated with anatomical lesions (eg, spinal facet joint osteoarthritis, impinging spinous processes, distal tarsal joint osteoarthritis, etc). However, there is a lack of adequate correla-





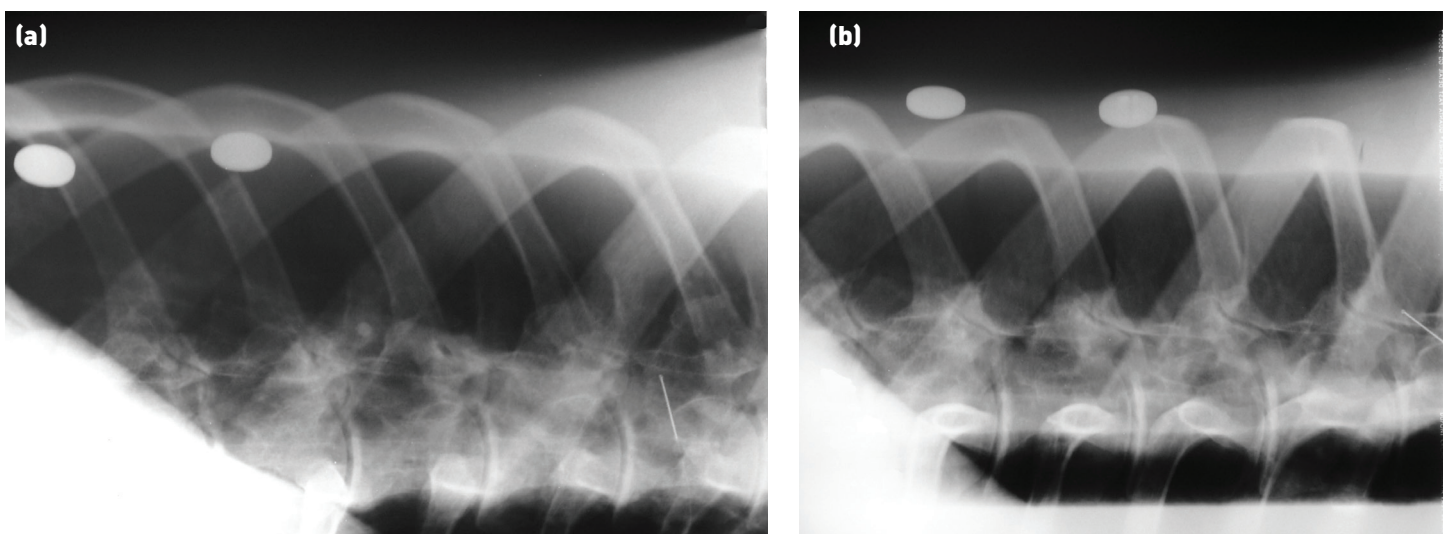
**Fig 2:** (a, b) Acupoints from head to feet are examined for underlying soft tissue tone, chronic pain signs of allodynia, hyperaesthesia and induced fasciculation. Pain signs are evident in the lower thoracic epaxial acupoints in the same horse as in Fig 1

tion studies against pain-free horses to understand the level of confidence in such diagnoses which, in turn, play a major role in treatment decisions, some of which are invasive with significant morbidity and adverse reaction risks. Improvements in imaging capability may be a double-edged sword. Correlation studies in people have shown that in adults with chronic lower back pain the assessment of MRI of the lumbar spine does not reliably predict pain or response to treatment (Chou and others 2007).

In 1997, I discovered that a lateral oblique radiographic projection taken on both sides of equine thoracic vertebrae offered anatomical details and a side-to-side comparison of the vertebral facet joints not visible on the standard lateral projection (Fig 3). Initially, these radiographs were taken on horses that were exhibiting back pain in the same region, while searching for an improvement in imaging of the spine, as back pain in the caudal thoracic epaxial mus-

cles is commonplace. The radiographic evidence of osteoarthritis of the facet joints was believed to be the cause of the back pain and therefore a predictor of prognosis. However, in following these cases, and others with similar radiological findings that exhibited no pain in caudal thoracic spinal segments, it became evident that the image findings were not a good predictor of the presence of or the degree of pain, nor of the prognosis for future use.

Signs of chronic pain may occur in the absence of anatomical lesions and may be absent in the presence of lesions. While this may pose an inconvenience in explaining a horse's signs of pain, the practice of acupuncture is based on function over form and is perfectly suited to dealing with syndromes and conditions that do not conform to textbook diseases. It can enable better detection of pain and provides a safe and valuable treatment option, whatever the radiological findings.

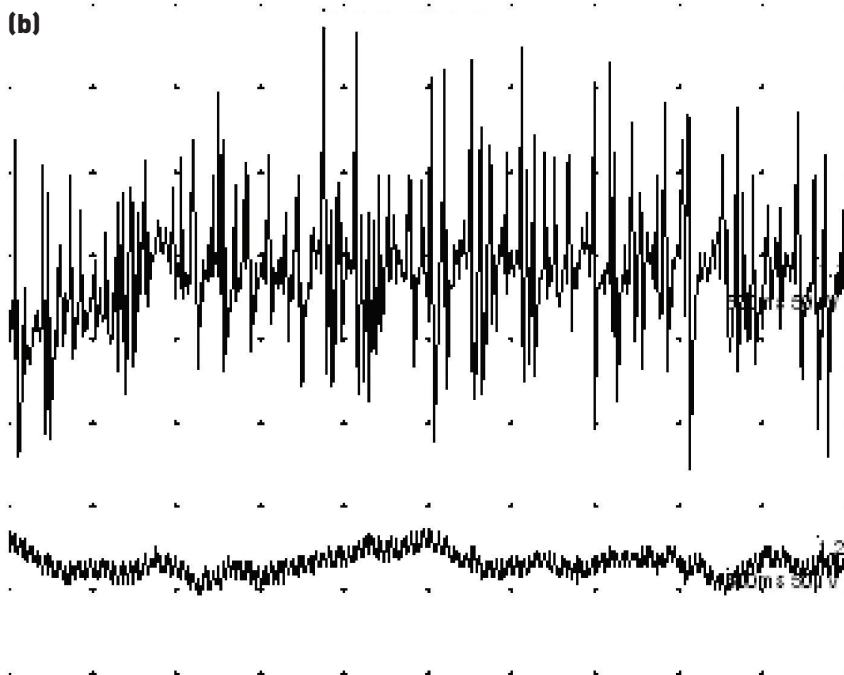


**Fig 3:** (a) Left and (b) right lateral oblique radiographic projections of the caudal thoracic spine demonstrating significant osteoarthritic findings, especially in the left-sided vertebral facet joints taken during an acupuncture treatment (the thin metallic opacities superimposed on the vertebral bodies are acupuncture needles). This horse did not improve with NSAIDs, but pain resolved during a course of acupuncture. Facet joint pathology is questionable as the pain generator, perhaps more a myofascial pain syndrome in this case

The case shown in Fig 3 is an example of a novice dressage horse with a history of training resistances referred for acupuncture. It had previously been diagnosed as having a training issue unrelated to pain (negative survey radiological and scintigraphic findings and no response to NSAIDs). The initial acupuncture examination findings included focal pain signs at a number of acupuncture points in the 12th to 18th thoracic segments that may be missed in a conventional palpation. These resolved over a course of five to six treatments of acupuncture and the performance level was fully recovered. Over the past 12 years, the horse has continued to receive acupuncture treatments at one to three month intervals, without recurrence of the original presenting signs. Since then, it intermittently develops low-grade epaxial muscle pain signs at the thoracolumbar junction to the mid-lumbar level, despite the radiological abnormalities being further forward.



**Fig 4: (a) Needle electromyogram (EMG) study of myofascial trigger points (MTrP). The lower recording needle is placed in the painful MTrP in the cleidobrachialis muscle; the upper needle is placed in a non-painful acupoint as a control. An earth lead is taped onto the chest. (b) The upper EMG trace records abnormal spontaneous electrical activity in the MTrP, while the lower trace records normal electrical activity in the non-painful acupoint**



Kissing spine cases are widely acknowledged to show poor correlation between the degree of radiological changes and pain or disability signs. Cases where pain signs predominantly involve the epaxial muscles respond very well to acupuncture, providing there is still normal muscle mass and spinal posture. When pain appears focused to the dorsal spinous processes with minimal epaxial muscle pain, or with substantial epaxial muscle atrophy with poor posture, the results are less satisfactory, and the required multimodal rehabilitation efforts are lengthy and costly with a poorer prognosis. Electroacupuncture is sometimes preferred in back pain cases and has been used in horses (Xie and others 2005). I prefer to use electroacupuncture in cases involving muscle atrophy.

## Myofascial pain syndrome and myofascial trigger points

It is proposed that myofascial pain syndrome (MPS) is a common condition in horses, but is underdiagnosed due to a lack of recognition or reference to it in standard veterinary texts. MPS has over 50 years of research in human medicine and is considered to have a high incidence among chronic pain sufferers. It requires a particular palpation skill of muscles to identify an abnormally taut band with a discrete locus that elicits obvious pain responses on deep palpation and a local twitch response to cross fibre manipulation. These are the myofascial trigger points (MTrP) and the locations mapped in people have been shown to have a high correlation with traditional acupuncture point locations (Melzack and others 1977). MPS may coexist with other orthopaedic conditions, but unlike such conditions it does not have an abnormal radiological or serum biochemistry finding nor does it respond to NSAIDs or corticosteroids.

MPS is associated with MTrPs – defined as the result of dysfunctional motor end plates and central sensitisation – and has abnormal electromyographic changes, including spontaneous electrical activity and electrical spikes (Fricton and others 1985). The same phenomena have been documented in rabbits (Hong and Torigoe 1994) and in horses (Macgregor and Graf von Schweinitz 2006) (Fig 4). Affected muscles develop a chronic local vasoconstriction, oxygen deficit, lowered pH and energy crisis. Acupuncture needling of the MTrP elicits a local twitch response and effects a reflexive reset mechanism. Regular acupuncture examinations enable the early recognition of MTrPs and early treatment is very effective in eliminating them. In longer-term cases, where there are numerous MTrPs, the acupuncture treatments required increase and the condition improves, but is rarely eliminated.

## Osteoarthritis

Joint pain and osteoarthritis can be treated with acupuncture. The competition horse under drug-free rules and the horse with significant NSAID side effect risks are appropriate examples of when to use acupuncture along with other physical therapies, including ice, shock wave, laser and pulsed electromagnetic stimulation. Lameness cases often demonstrate a residual stiffness after a positive diagnostic nerve blocking result. This may indicate other less overt distal limb pain, other proximal limb, neck, or back pain, or a combination of these issues. The acupuncture examination often discovers superimposed myofascial pain and treatment with acupuncture, in addition to the standard conventional treatment, will make a notable improvement in recovery and performance.



A common assumption is that signs of pain in the neck or back are secondary to limb pain and will resolve spontaneously with treatment of the limb. In my experience, myofascial pain does not resolve spontaneously, and often worsens with exercise restrictions imposed in the management of many lower limb injuries (ie, lack of movement worsens MPS). Acupuncture is again extremely helpful in addressing myofascial pain and the psychological stress that often occurs with box rest and other restrictions.

A recent study of acupuncture treatments on objective and subjective gait parameters in pastured horses was conducted at the Royal Veterinary College (Dunkel and others 2016). The researchers used a commonly employed palpation-based assessment to select the acupuncture points for each case. This study found that acupuncture treatment, as commonly performed in equine veterinary practice, improves the gait of horses in a positive manner and the changes could be appreciated by both objective and subjective gait analyses.

## Summary

There is a growing awareness that anxiety and emotional factors are major modulators of the pain experience, and increasing evidence that acupuncture's anxiolytic effects on the limbic system are more important than its effects on endogenous opioid release. Acupuncture is an enhancement or enabling intervention in the inherent coping and homeostatic mechanisms. Besides pain management, there are many other acupuncture applications in gastrointestinal, respiratory and fertility cases. It has an excellent benefit to risk profile and is the ideal partner in IVM. Acupuncture should be regarded as part of multimodal pain management. In the case of competition horses it offers a further benefit as a treatment option without offending medication restrictions.

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## Quiz: Using acupuncture to treat pain in horses

- Acupuncture needle manipulation inhibits the local release of adenosine in the region of inflammation. Is this statement true or false?
  - True
  - False
- Which of the following sensations have not been associated with 'de qi' in people?
  - Aching
  - Tingling
  - Itching
  - Warmth
  - Coolness
  - Heaviness
- Complete the following sentence choosing one of the options in brackets.  
'Studies of the acupuncture de qi responses in chronic pain patients using fMRI have demonstrated a **(deactivation/activation)** in the limbic system and **(inhibition/restoration)** of functional connectivity with the DMN are associated with chronic pain relief.
- Which of the following statements are true? There may be more than one answer.
  - MPS signs improve with restricted exercise and steroids
  - MPS signs are associated with myofascial trigger points (MTrPs) that have a high correlation in people with traditional acupuncture point locations
  - MTrPs are associated with abnormal EMG activity
  - MTrPs are associated with raised muscle enzymes in serum
  - MTrPs respond to direct needling to elicit a local twitch response
- A recently published study (Dunkel and others 2016) of palpation-based acupuncture treatments in horses found objective and subjective gait improvements after the treatments. Is this statement true or false?
  - True
  - False

Answers:

1. b
2. c
3. deactivation and restoration
4. b, c and e
5. a



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