

# Acupuncture in Cattle Practice

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## Key Facts

1. **Acupuncture is one of the oldest forms of medical treatment.**
2. **Many of the mechanisms which modulate acupuncture have now been demonstrated by recent neurophysiological and neurohumoral research.**
3. **Acupuncture is a valuable adjunct in the treatment of many functional, metabolic and musculo-skeletal disease of cattle.**

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## Traditional Chinese Acupuncture

Acupuncture has been practiced by the Chinese for at least 3000 years and it was introduced into Europe about 300 years ago. It is clear from the writings of that time that the concepts on which the Chinese based their curious practices were difficult to comprehend, due to the fact that these appeared to be completely at variance with what Europeans by that time had come to know about the anatomy and physiology of the human body. It has been this inability to reconcile the theoretical concepts put forward by the Chinese in support of acupuncture with those upon which modern scientific medicine is based that has for so long been the cause of such little interest being taken in the Western World. During the past 30 years, however, attitudes towards acupuncture in the West have been changing since research into the mechanisms of pain has provided a certain amount of insight as to how it achieves its effect on pain. The concepts which led the Chinese to use acupuncture for therapeutic purposes were complex and to the modern Western mind difficult to comprehend. They were bound up with their views concerning all aspects of the living world, including in particular their belief in the existence of two cosmic regulators known as Yin and Yang. Further, the Chinese believed that Yin and Yang exerted a considerable influence in the preservation of order in all natural phenomena, both celestial and terrestrial, which depended on a maintenance of a correct balance between the two. It was also considered

that this health-giving balance between Yin and Yang only existed when a special form of energy, known as Chi, flowed freely through a system of channels and as a corollary of this disease developed when one or other of these channels became blocked, interrupting the flow of Chi leading to an imbalance of Yin and Yang.

## Scientific Basis of Acupuncture

Many mechanisms by which acupuncture may work for pain relief have been well reviewed. There may be multiple mechanisms involved and this is highly probable since acupuncture works for a multitude of non-painful complaints, including asthma, nausea and vomiting. The correlation of many acupuncture points with the course of underlying nerves has been noted. Local anaesthetic solution injected into acupuncture points can block the effect of acupuncture leading to a neural theory of its action.

## Neurophysiology and Pharmacology of Acupuncture

Much of the early work was carried out by Han and his colleagues in the University of Beijing. The conclusions drawn were that the key links were 5HT (serotonin) endogenous opiates and catecholamines. Further research was stimulated by Melzack and Wall's proposed gate control of pain.

## Acupuncture Analgesia and Endogenous Opiates

A specific test of an opioid mechanism is the reversibility of acupuncture to the administration of naloxone. A number of experiments provided support for the theory that the release of endogenous opioids could mediate acupuncture analgesia. A small number of experiments did not show the expected findings and one possible explanation for the discrepancies was that low frequency acupuncture may be naloxone reversible whereas high frequency electro-acupuncture was not.  $\beta$  endorphin may be expected to be a principal mediator because of its ability to produce long lasting analgesia

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when injected into the CSF of man whereas the pentapeptide, metenkephalin is rapidly broken down. In the studies carried out in man, the results have not all been consistent, depending on the type of acupuncture used and the character of pain studied. It seems that increases in endogenous opioids are more likely to occur in organic than in psychogenic pain states. Han has now shown that naloxone is not as effective at reversing the effect of the Kappa opiate receptor sites as the  $\mu$  sites.

Dynorphin products have been suggested as the endogenous ligands for the Kappa receptor. Dynorphin may be an important mediator of electro-acupuncture at the spinal level. Using anti-metenkephalin antiserum, he showed that low frequency acupuncture analgesia could be abolished but higher frequency acupuncture still produced analgesia. Using anti-dynorphin antiserum, high frequency acupuncture analgesia was diminished but low frequency acupuncture was still effective. This implies that metenkephalin may be involved with low frequency stimulation and dynorphin with higher frequency acupuncture.

### The Neural Theories

The gate theory of Melzack and Wall at its simplest suggested that transmission of pain impulses travelling from the periphery along pain fibres could be blocked by a "gate" which is modulated by a balance of peripheral nerve input or by a central descending pathway. This mechanism along with various receptors has been defined, the gate being in the cells of the substantia gelatinosa. Noxious or painful stimuli travel along C fibres and relay through the substantia gelatinosa to the transmission cell and then to the brain. Stimuli arising from peripheral A c fibres can moderate transmission of pain either directly i.e. segmentally through the enkephalinergic interneurone or indirectly and possibly extra-segmentally from a central loop which descends from the periaqueductal grey matter to the nucleus raphe magnus and then down the dorsolateral funiculus to the substantia gelatinosa. The transmitters involved are substance P, vasoactive inhibitory peptide, enkephalin and serotonin.

The simplest theory to explain how acupuncture analgesia works is that of segmental stimulation leading to direct inhibition of painful stimuli via enkephalinergic and descending inhibition. This would not explain the phenomenon of acupuncture working when the needles are sited at some distance from the source of pain. To explain how remote acupuncture stimulation causes analgesia, the ascending and descending pathways working through the periaqueductal grey matter and nucleus raphe magnus would have to be involved. Such remote analgesia would not be expected to be as good as segmentally placed needles with

a dual inhibitory capacity. Another possible mechanism was suggested by Le Bars *et al.* who showed that noxious stimuli applied at remote points could reduce painful stimuli in the rat paw from reaching the brain. This they termed diffuse noxious inhibitory control (DNIC). They went on to show that the effect was greatly reduced in the spinal rat implying a central relay.

### Nonopioid Mechanisms

There is growing evidence that acupuncture is mediated via non-opioid mechanisms which may help to explain why some examples have been shown to be naloxone reversible whereas others are not. 5HT or serotonin is an integral component in the gate theory. Levels of serotonin in the rat brain and the C.S.F. of animals have been found to increase after acupuncture. Parachlorophenylalanine which blocks synthesis of serotonin, reduces the degree of analgesia of acupuncture and morphine. A central relay is necessary for this mechanism, as it is absent in spinal rats. Acupuncture analgesia is reduced by competitive blocks to serotonin such as cyproheptadine. Loading with a precursor to serotonin can increase the effect of acupuncture analgesia.

Autonomic factors are involved with acupuncture which have been shown to have a sympatholytic effect, as evidenced by thermography.

It is likely that many neurotransmitters modulate acupuncture analgesia, as may endocrinological factors. In support of the autonomic nervous system approach, acupuncture points do, in many cases, correspond with Head's areas of referred pain. According to Head's postulate, the cutaneous pain felt in visceral disease is located in the area where sensory nerves enter the spinal cord at the same segmental levels which supply nerves to the viscera concerned. It may be that cutaneous stimulation by needles is transmitted to the internal viscera through somatovisceral neuronal synapses in the spinal cord. During the process of synapses, either the parasympathetic or sympathetic components of the visceral nerves seem to be selectively stimulated and the function of the autonomic nervous system is regulated.

Two questions not answered are why the analgesic effect of acupuncture lasts for 30 - 60 minutes after discontinuing stimulation when used for surgical analgesia and why chronic pain can be eliminated after multiple treatments. Chronic pain is said to be the result of storage of the original pain sensation in memory banks of the pain-receiving cells after the patient has been healed of the injury. Examples cited are phantom limb pain and dental causalgia in people. Acupuncture is said to produce an amnesic effect in the memory banks of pain receiving cells, thus diminishing or obliterating chronic pain. It has been proposed that these memory

banks in pain receiving cells can be activated or deactivated by weather or barometric pressure conditions, explaining why some chronic pain seems to be weather affected.

### Current Uses of Acupuncture in Cattle Practice

In 1954 Kothbauer demonstrated the use of somatovisceral synapses for the diagnosis and treatment of several urogenital diseases of cattle. These associated points, known as Shu points, are situated on the bladder meridian which runs down each side of the spine. He followed this by using acupuncture analgesia for teat surgery and in 1974 started to carry out caesarian operations under acupuncture analgesia. The author has carried out several laparotomies in cattle using electroacupuncture analgesia.

The associated points often show tenderness in diseases of other viscera and can be used as an adjunct to Western medicine either by needling them or injecting small quantities of the relevant Western therapeutic agent into them. Certain of these points are useful in dilating the birth canal and for the replacement of uterine prolapse.

Most functional and metabolic diseases can be helped by acupuncture including the downer cow.

### Summary

Acupuncture is only a part of Chinese medicine and is not a complete or alternative system but must be taken seriously as a clinical procedure of considerable value. It is not a panacea for all ills, but having practiced it now for over 12 years, the results obtained lead me to the belief that it should receive much more attention as a clinical technique for the treatment of many diseases, either alone or in conjunction with Western medicine.

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## Effects of gonadotrophin releasing hormone administered 11 days after insemination on the pregnancy rates of cattle to the first and later services.

I. M. Sheldon, H. Dobson.

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In a trial using 2530 recorded services of 1619 animals on 19 commercial dairy farms, alternate cows were injected intramuscularly with 10 µg busserelin, an analogue of gonadotrophin releasing hormone (GnRH), (Receptal; Hoechst Animal Health) 11 days after insemination. Pregnancy was diagnosed manually six to 12 weeks after the last service in all but three herds, for which calving data were collected. The pregnancy rates were calculated for control and treated cows, paired for calving to first service interval, parity and week of service. For 520 pairs of control and treated cows the pregnancy rates to first service were 50.6 per cent and 60 per cent, respectively ( $P < 0.01$ ). For the second and subsequent services each cow was grouped according to its treatment or control status in the immediately preceding dioestrus period, in addition to its status on day 11 after service. As a result there were three treated groups: treated, treated; treated, control, and control, treated for comparison with the control, control group. For 136

pairs of control, control and control, treated cows the pregnancy rates to second service were 41.2 per cent and 54.4 per cent, respectively ( $P < 0.05$ ), and for 67 similar pairs of cows the pregnancy rates to the third or later service were 23.9 per cent and 52.2 per cent, respectively ( $P < 0.01$ ). For 40 pairs of control, control and treated, treated cows the pregnancy rates to the third or later service were 15.0 per cent and 45.0 per cent, respectively ( $P < 0.01$ ). The pregnancy rates of cows that were treated, treated at the second service or treated, control at the second or later services, were not significantly different from the pregnancy rate of control, control cows. Inter-oestrus intervals of 11 to 17 days occurred in 7 per cent and 2 per cent of the control and treated cows, respectively ( $P < 0.01$ ), suggesting that the increased pregnancy rates after treatment were associated with a reduction in the number of cows with inter-oestrus intervals of less than 18 days.