Does needling stimulate erythrocyte-based local analgesia?

Acupuncture, a traditional healing art surviving over four millennia, has its roots in indigenous Chinese Daoism. Although modern acupuncturists disregard Daoist philosophy, needling itself has never lost its basis of naturalness and simplicity. Acupuncture was fostered in the oriental world and reached many Western nations as a treatment for various chronic conditions, particularly pain. Evidence from several models has shown the analgesic effect of acupuncture, and yet there is no complete picture of how the needle works locally.

Recently, it was shown that acupuncture employs adenosine as a mediator for local pain control. Adenosine, a purine nucleoside, is present in large amounts only in response to needle stimulation at particular acupuncture points. Adenosine and its interaction with adenosine receptor A1 seems to blunt pain sensations. Since the physiological half-life of adenosine is extremely short (a few seconds in human plasma), its natural action is transient. Blockade of enzyme-induced degradation of adenosine via deoxycoformycin can prolong the regional accumulation of adenosine and promote the antinociceptive effect. Since a short course of traditional acupuncture can provide longlasting remission of pain, the adenosine-mediated effect cannot be the complete explanation of acupuncture analgesia.

*Ling Shu* (the *Spiritual Pivot*), the earliest written teachings on acupuncture, contains descriptions of the same acupuncture point being used for acupuncture or for blood-letting treatment. It has been suggested that acupuncture points represent loci where needles can easily access the vascular network. Moreover, in a study using a model of neuropathic pain in rats, non-responders to electroacupuncture-induced antiallodynic effects exhibited low expression of haemoglobin β chain in comparison with responders. Until now, haemoglobin β chain-associated analgesia has not been considered as a mechanism for acupuncture.

Acupuncture is a series of procedures involving insertion of one or more fine needles into strategic sites and subsequent stimulation of the retained needles by hand. Minor damage is caused by needle manipulation. On needling, erythrocytes may escape through gaps in small vessel walls. Then, manual stimulation might elicit bleeding around the needle, even if it is not clinically apparent. Recently, erythrocytes have been shown to be signalling cells for production and excretion of analgesic peptides. The haemorphin family is a spectrum of sequentially overlapping peptides originating from proteolysis of the haemoglobin β chain. The analgesic effect of haemorphins is mediated through the opioid pathway. Mechanical trauma to erythrocytes increases the level of haemorphins in patients undergoing haemodialysis, open-heart surgery or cerebrovascular haemorrhage. Haemorphin can have sustained effects (hours to days), and thus,
we propose that haemorphin may be involved in acupuncture analgesia.

We hypothesise that a fine needle enhances the release of erythrocyte-derived haemorphins (figure 1). Acupuncture is regarded as a positive trauma giving individuals the opportunity to stimulate their innate antinociceptive response. Haemorphin-mediated local analgesia adds a fresh dimension to the possible mode of action of acupuncture.

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