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TITLE: HALOTHANE MAC MODIFICATION BY ACUPUNCTURE AND NALTREXONE

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Introduction. Acupuncture has been practiced in China for thousands of years for both its therapeutic and analgesic properties. More recently, Chinese physicians have claimed that acupuncture can create an analgesic state sufficient for surgery. Acupuncture was reintroduced into America in 1972. Since then its analgesic effect has been studied in man and animal. Initial Western clinical reports showed that acupuncture analgesia could be obtained consistently only in a few patients. In human and animal experimental pain studies, acupuncture and electroacupuncture elicited a more consistent analgesic effect.¹

Many explanations for the efficacy of acupuncture and electroacupuncture have been proposed. Currently, the favored hypothesis relates acupuncture and electroacupuncture analgesia to the production of endorphins. Naloxone reversibility of acupuncture effect is taken to imply endorphin mediation. Also, any dependence of acupuncture analgesia on brain stem modulation is unresolved. We previously demonstrated on electroacupuncture lowering of halothane MAC in the dog.² In our present study we sought any narcotic antagonist reversibility of this electroacupuncture phenomenon.

Methods. Ten unmedicated mongrel dogs, weighing 7-10 kg, were anesthetized with halothane in oxygen and mechanically ventilated. Esophageal temperature, ECG and arterial blood pressure were monitored continuously. A foreleg vein was cannulated for administration of fluids. Body temperature was maintained between 36-38° C.

End tidal halothane was continuously monitored with a Beckman LB-2 infrared gas analyzer. A given end tidal anesthetic concentration was maintained at least 15 minutes prior to the determination of MAC by the method of Eger. MAC was determined in duplicate.

Following determination of the control MAC, all animals received electroacupuncture for 30-45 minutes; MAC was taken again in duplicate while electroacupuncture continued. Electroacupuncture was performed bilaterally at San-Yin-Chiao (over the medio-posterior aspect of the tibia, between distal and middle third). Stainless steel, 6.6 cm, acupuncture needles were inserted. The electrical stimulus was a filtered square wave; pulse width was 1 msec at 2 Hz and 0.7 msec at 200 Hz. The pattern was a 2 Hz signal continuously for 5 minutes, alternating with 5 minutes of a 200 Hz stimulus given for 3 seconds followed by a 1 second rest. Three to four volts maximum amplitude was used, producing minimal local muscle twitch. MAC was determined a third time following 5 mg/kg naltrexone intravenously; electroacupuncture was continued throughout.

The same experiment was repeated on 6 dogs, using 0.5 mg/kg of naltrexone intrathecally instead of intravenously.

Results and Discussion. Electroacupuncture significantly lowered halothane MAC in this experiment consistent with our previous study.² Our study failed to show any reversal of electroacupuncture analgesia by a pure antagonist injected intravenously or intrathecally. Intrathecal injections also did not influence halothane MAC.

Previous studies in human, rats and mice have shown that acupuncture analgesia can be antagonized by narcotic antagonists. It has thus been claimed that acupuncture analgesia is endorphin mediated. However, our work does not show this reversal. Recently, electroacupuncture analgesia was shown to be naloxone reversible only at a low frequency of stimulation (2-4 Hz). High frequency (50-200 Hz) electroacupuncture analgesia was not reversed by naloxone, but was partially blocked by parachlorophenylalanine (a serotonin synthesis inhibitor).³ This report suggests that analgesia elicited by high frequency stimulation is at least partially mediated by serotonin.

There are several possible explanations for our results. There might be different physiological mechanisms of electroacupuncture analgesia by species. Secondly, alternate low and high frequency stimuli were used in this experiment. Perhaps the high frequency effect predominated. Finally, electroacupuncture might have a variety of effects mediated by both endorphins and other neurophysical mechanisms.

References.

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3. Cheng R, Pomeranz B: Electroacupuncture analgesia could be mediated by at least two pain relieving mechanisms: endorphin and non-endorphin systems. *Life Sci* 25:1957-1962, 1979

ALTERATIONS IN HALOTHANE MAC BY ELECTROACUPUNCTURE AND NALTREXONE (PERCENT ATM: MEAN ± SEM)

	CONTROL	ELECTRO-ACUPUNCTURE	NALTREXONE
n=10 - IV	1.21%±0.04%	1.05%±0.05%	1.06%±0.04%
n=3 - IT	1.17%±0.05%		1.14%±0.02%
n=3 - IT	1.21%±0.05%	0.06%±0.04%	0.96%±0.04%