The anti-inflammatory effects of low- and high-frequency electroacupuncture are mediated by peripheral opioids in a mouse air pouch inflammation model.

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BACKGROUND: Although acupuncture has been widely used for complementary therapeutic approaches to treat inflammatory diseases and inflammation-induced pain, the potential anti-inflammatory effects of acupuncture treatment remain controversial in clinical trials, and the underlying mechanisms are still unclear. OBJECTIVE: The objective was to determine whether electroacupuncture (EA) is able to suppress the peripheral inflammatory response (e.g., zymosan-induced leukocyte migration into air pouch). As part of a mechanistic approach, it was further evaluated whether endogenous opioid systems are involved in the "EA-induced anti-inflammatory effect" (EA-AI). METHODS: EA (1 or 120 Hz) was performed bilaterally in the Zusanli acupoint (ST36) or in a nonacupoint (gluteal muscle) for 30 min in ICR mice under anesthetic condition. The number of leukocytes that migrated into the air pouch was counted 4 hours after zymosan injection. EA was performed at 0, 0.5, 1, or 2 hours prior to zymosan injection, respectively. To evaluate opioid involvement in EA-AI, intrathecal naloxone (36 microg/mouse) and intraperitoneal naloxone methiodide (30 mg/kg) were administered 10 min before EA stimulation. RESULTS: Both the 1 and 120 Hz frequencies of EA into Zusanli acupoint at the same time with zymosan injection significantly reduced leukocyte migration into the air pouch as compared with those of control groups (i.e., anesthetic control and needling control into Zusanli acupoint without electrical stimulation). The EA stimulation into nonacupoint did not produce any significant anti-inflammatory effect. EA treatment at 0.5 hours prior to zymosan injection also produced an anti-inflammatory effect but 1 and 2 hours prior to zymosan injection did not elicit any effect. Peripheral opioid blockage significantly reversed EA-AI, whereas spinal opioid blockade did not alter EA-AI. CONCLUSION: EA can suppress peripheral inflammation through a peripheral opioid mechanism. To achieve the full effectiveness of EA, repeated application is recommended for the treatment of a variety of inflammatory diseases.