

# Medical PEMF Studies



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## EDEMA

**Nonthermal electromagnetic fields: from first messenger to therapeutic applications.**



1. Electromagn Biol Med. 2013 Jun;32(2):123-36. doi: 10.3109/15368378.2013.776335.

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## Comment in

Electromagn Biol Med. 2014 Dec;33(4):251.

Nonthermal pulsed electromagnetic fields, from low frequency to pulse-modulated radio frequency, have been successfully employed as adjunctive therapy for the treatment of delayed and non-union fractures, fresh fractures and chronic wounds. Recent increased understanding of the mechanism of action of electromagnetic fields (EMF) has permitted technologic advances allowing the development of EMF devices which are portable and disposable, can be incorporated into dressings, supports and casts, and can be used over clothing. This broadens the use of non-pharmacological, non-invasive EMF therapy to the treatment of postoperative pain and edema to enhance surgical recovery. EMF therapy is rapidly becoming a standard part of surgical care, and new, more significant, clinical applications for osteoarthritis, brain and cardiac ischemia and traumatic brain injury are in the pipeline. This study reviews recent evidence which suggests that calmodulin (CaM)-dependent nitric oxide signaling is involved in cell and tissue response to weak nonthermal EMF signals. There is abundant evidence that EMF signals can be configured a priori to increase the rate of CaM activation, which, in turn, can modulate the biochemical cascades living cells and tissues employ in response to external insult. Successful applications in pilot clinical trials, coupled with evidence at the cellular and animal levels, provide support that EMF is a first messenger that can modulate the response of challenged biological systems.

PMID: 23675615 [PubMed - indexed for MEDLINE]