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Pulsed electromagnetic fields modulate enzymatic activity during the early stages of bone repair

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Abstract
The goal of this study was to investigate whether PEMFs influence enzymatic activities during the early stages of bone repair. Two transcortical holes (4.5 mm diameter) were drilled at the same diaphyseal level in the lateral margin of the right and left metacarpal bone (McIII) of six adult male horses. The left McIII were exposed to PEMFs (75 Hz; 2.8 mT, 1.3 ms impulse width) 24 h/day; the right untreated McIII were used as controls. Horses were sacrificed 8 and 15 days after the operation. The bone segments containing the holes were fixed, dehydrated in ethanol solutions, and, undecalcified, embedded in methylmethacrylate. The midlongitudinal sections of the holes were either stained with soluidine blue or processed for evaluation of the total alkaline phosphatase (TALP) and the tartrate-resistant acid phosphatase (TRAP). In PEMF-treated holes we found: (1) TALP is strongly positive with respect to the controls; (b) the newly formed bony trabeculae are more abundant than in the controls; (c) in both treated and control holes, no TRAP-positive osteoclasts were observed on the hole surface, whereas several osteoclasts were located on the newly formed bone tracebulae. On the basis of these data, it may be concluded that PEMFs accelerate the healing process of transcortical holes and enhance the enzymatic activity of repair tissue.

Author Keywords
Acid phosphatase; Alkaline phosphatase; Bone repair; Horse; PEMFs

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