

## **Electromagnetic Fields Promote Severe and Unique Vascular Calcification in an Animal Model of Ectopic Calcification**

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Electro Magnetic Field (EMF) stimulation promotes bone formation and is utilized for enhancement of bone fractures healing. However its effect of ectopic calcification is unknown. Renal failure is associated with cardiovascular calcification, therefore we sought to evaluate the effects of EMF on vascular calcification in an animal model of diet-induced kidney disease.

### **Methods:**

Two study groups of rats –"EMF group"and "Diet group" (n=10 in each group) - were fed exclusively with a phosphate-enriched, uremia-inducing diet for 7 weeks. An additional group served as controls. "EMF group" rats were continuously exposed to alternating electro-magnetic fields with frequencies of 100-400 kHz.

Clinical investigations included serum creatinine and phosphate levels, and multislice computed tomography for aortic roots. Pathological evaluation of aortas included histological characterization, Von-Kossa staining, and antigen expression.

### **Results:**

All "diet group" and" EM group" rats developed renal failure and hyperphosphatemia. Aortic root calcification was found in all "diet group" and "EM group" rats, and was significantly higher in the " EM group" compared with the "diet group" - with a mean Agatston score of  $105\pm 15$  vs.  $23\pm 7$  respectively ( $p<0.05$ ). No calcification was found in controls.

Gross and histological examinations showed massive aortic calcification in rats exposed to EMF. Further, calcification pattern was unique, as it was formed in circles along the length of the aortic media, with relative spared areas between the calcified rings.

Expression of osteoblast markers (RUNX-2 and osteopontin) was significantly increased in "diet group" compared with "EMF group" and controls.

### **Conclusions:**

EMF exposure has potential harmful effects, as it promotes severe vascular calcification. Calcification has a unique pathological pattern with no activation of osteoblasts. This suggests different pathophysiological pathway of calcification caused directly by EMF. This novel observation is important as EMFs are widely utilized in modern world without data on their effects.