

## **Vitamin K Treatment Reduces Undercarboxylated Osteocalcin But Does Not Alter Bone Turnover or Density in Postmenopausal North American Women**

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Prior data suggest that vitamin K may improve skeletal health by enhancing osteocalcin carboxylation. For example, low vitamin K status, as measured by elevated undercarboxylated osteocalcin concentration, is associated with increased osteoporotic fracture risk. Additionally, some studies find vitamin K treatment reduces vertebral fracture risk. However, whether vitamin K plays a role in the skeletal health of North American women remains unclear. Moreover, it is possible that various K vitamins (phylloquinone [K1] and menatetrenone, [K2/MK4]) have differing skeletal effects. The purpose of this study was to evaluate the effect of K1 or MK4 treatment on markers of skeletal turnover and bone density in non-osteoporotic, postmenopausal, North American women.

As such, in this randomized, double-blind, placebo-controlled study, 381 women not meeting the National Osteoporosis Foundation criteria for receipt of osteoporosis medications received K1 (1 mg daily), MK4 (45 mg daily) or placebo for 12 months. All participants received calcium citrate with vitamin D3 (315 mg/200 IU) twice daily for two months prior to randomization and for the study duration. Serum markers of bone turnover (bone specific alkaline phosphatase [BSAP] and n-telopeptide of type 1 collagen [NTx]) were measured at baseline, 1, 3, 6 and 12 months. Bone mineral density (BMD) of the lumbar spine and proximal femur was measured by dual-energy x-ray absorptiometry at baseline, 6 and 12 months and calcaneal ultrasonometry was performed in a random subset at baseline and 12 months. This preliminary analysis includes BMD data on all 359 study completers and turnover data on approximately 290 study completers. At baseline, the three treatment groups did not differ in age, albumin, creatinine, AST, BSAP, NTx, percent undercarboxylated osteocalcin or BMD. Among the 381 women enrolled in this study, compliance with calcium supplements, K1 and MK4 treatment was 93%, 93% and 87% respectively. K1 and MK4 treatment reduced serum undercarboxylated osteocalcin by 72% and 74% respectively, averaged over all follow-up visits; the decreases were immediate and stable. No effect of either K1 or MK4 treatment was observed on BSAP or NTx. Moreover, no effect of K1 or MK4 on lumbar spine or total proximal femur BMD, or calcaneal ultrasound parameters, was demonstrated.

This preliminary analysis does not support a role for vitamin K treatment in bone turnover or density among postmenopausal North American women receiving calcium and vitamin D supplementation.