

## Effect of combined administration of vitamin D<sub>3</sub> and vitamin K<sub>2</sub> on bone mineral density of the lumbar spine in postmenopausal women with osteoporosis

Jun Iwamoto<sup>1</sup> · Tsuyoshi Takeda<sup>1</sup> · Shoichi Ichimura<sup>2</sup>

Affiliations & Notes Article Info



Get Access

Cite

Share

Set Alert

Get Rights

Reprints

Previous article Next article

### Abstract

Show Outline

The effect of the combined administration of vitamin D<sub>3</sub> and vitamin K<sub>2</sub> on bone mineral density (BMD) of the lumbar spine was examined in postmenopausal women with osteoporosis. Ninety-two osteoporotic women who were more than 5 years after menopause, aged 55–81 years, were randomly divided into four administration groups: vitamin D<sub>3</sub> (1 $\alpha$  hydroxyvitamin D<sub>3</sub>, 0.75 $\mu$ g/day) (D group; n 5 29), vitamin K<sub>2</sub> (menatetrenone, 45mg/day) (K group; n 5 22), vitamin D<sub>3</sub> plus vitamin K<sub>2</sub> (DK group, n 5 21), and calcium (calcium lactate, 2g/day) (C group; n 5 20). BMD of the lumbar spine (L2–L4) was measured by dual energy X-ray absorptiometry at 0, 1, and 2 years after the treatment started. There were no significant differences in age, body mass index, years since menopause, and initial BMD among the four groups. One-way analysis of variance (ANOVA) with repeated measurements showed a significant decrease in BMD in the C group (P, 0.001). Two-way ANOVA with repeated measurements showed a significant increase in BMD in the D and K groups compared with that in the C group (P, 0.05 and P, 0.001, respectively), and a significant increase in BMD in the DK group compared with that in the C, D, and K groups (P, 0.0001, P, 0.05 and P, 0.01, respectively). These findings indicate that combined administration of vitamin D<sub>3</sub> and vitamin K<sub>2</sub>, compared with calcium administration, appears to be useful in increasing the BMD of the lumbar spine in postmenopausal women with osteoporosis.

This paper is only available as a PDF.

### Key words

Vitamin D<sub>3</sub> · Vitamin K<sub>2</sub> · Postmenopausal women · Osteoporosis · Bone mineral density (BMD)

### Get full text access

Log in, subscribe or purchase for full access.

Get Access

### References

1. Aloia, J.F. · Vaswani, A. · Yeh, J.K. ...  
**Calcitriol in the treatment of postmenopausal osteoporosis**  
*Am J Med.* 1989; **84**:401-408  
[Abstract](#) [Full Text \(PDF\)](#) [Scopus \(214\)](#) [Google Scholar](#)
2. Beresford, J.N. · Gallagher, J.A. · Poser, J.W. ...  
**Production of osteocalcin by human bone cells in vitro. Effects of 1,25(OH)<sub>2</sub>D<sub>3</sub>, 24,25(OH)<sub>2</sub>D<sub>3</sub>, parathyroid hormone, and glucocorticoids**  
*Met Bone Dis Rel Res.* 1984; **5**:229-234  
[Abstract](#) [Full Text \(PDF\)](#) [Scopus \(490\)](#) [PubMed](#) [Google Scholar](#)
3. Christiansen, C. · Christiansen, M.S. · Rodbro, P. ...  
**Effect of 1,25-dihydroxy-vitamin D<sub>3</sub> in itself or combined with hormone treatment in preventing postmenopausal osteoporosis**  
*Eur J Clin Invest.* 1981; **11**:305-309  
[Crossref](#) [Scopus \(89\)](#) [PubMed](#) [Google Scholar](#)
4. Cumming, R.G.  
**Calcium intake and bone mass: a quantitative review of the evidence**  
*Calcif Tissue Int.* 1990; **47**:194-201  
[Crossref](#) [Scopus \(319\)](#) [PubMed](#) [Google Scholar](#)

### Article metrics

92

Citations

88

Captures

6

Social Media

PLUMX

[View details](#)

### Related articles (40)

Osteoporosis should be evaluated by bone mineral density at the combination of the lumbar spine and ipsilateral femoral neck in female patients with knee osteoarthritis scheduled for knee arthroplasty: A retrospective observational study

Kubo et al.  
*Journal of Orthopaedic Science*, July 27, 2024

Independent and combined associations of dietary antioxidant intake with bone mineral density and risk of osteoporosis among elderly population in United States

Zhou et al.  
*Journal of Orthopaedic Science*, August 1, 2023

Effects of eldecacitol alone or a bone resorption inhibitor with eldecacitol on bone mineral density, muscle mass, and exercise capacity for postmenopausal women with distal radius fractures

Maeda et al.  
*Journal of Orthopaedic Science*, December 18, 2020

[Show more](#)

Life Extension Magazine®



## Vitamin K2 Reduces Atherosclerosis

Vitamin K2 blocks the progression of arterial thickening and stiffening. Studies show higher vitamin K2 intake reduces the risk of dying from heart disease by 57%.

Scientifically reviewed by **Dr. Gary Gonzalez, MD**, in October 2024. Written by: Jennifer Ming.



In a new study, scientists have presented powerful evidence that **vitamin K2** can reduce the progression of **atherosclerosis**, the “blockage” of the arteries that can lead to heart attacks and strokes.

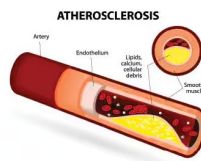
This is tremendous news for the millions of Americans who are at risk for cardiovascular disease, which remains the number one killer in the US.<sup>1</sup>

Scientists long ago learned that vitamin K2 plays a crucial role in activating proteins that help keep calcium where it belongs, in the bones, and out of blood vessels where it can cause problems.

Published data show that people with higher intake of vitamin K2 have a **57%** reduction in the risk of dying from cardiovascular disease, and as much as an **81%** reduction in non-vertebral fractures.<sup>2,3</sup>

Here, we'll review the important new study on atherosclerosis, and then examine previous findings that explain how vitamin K2 contributes so importantly to both cardiovascular and bone health in aging adults.

### Vitamin K2 Reduces the Progression of Arterial Thickening



Numerous studies have demonstrated that people with higher intakes of vitamin K2 have a reduced risk for cardiovascular disease.<sup>3,5</sup> Intrigued by this connection, Polish researchers from the Medical University at Lodz teamed up with researchers from Maastricht University in the Netherlands and Poland's International Science and Health Foundation to determine if vitamin K2 supplementation could *reduce the progression* of existing atherosclerosis.<sup>6</sup>

The scientists evaluated the progression of atherosclerosis in a group of 42 patients with chronic kidney disease.<sup>6</sup> These patients were ideal for this type of study because they are known to experience a rapid reduction in bone

mineral density (a measure of bone strength) as a result of calcium losses from bone.<sup>7,8</sup> They are also subject to equally excessive deposits of calcium in tissues where it doesn't belong—particularly in the walls of major arteries.<sup>9</sup>

For the study, the subjects were divided into two groups. One group received vitamin K2 (**90 mcg** per day) plus vitamin D3 (**400 IU** per day). The second group received only vitamin D3 (**400 IU** per day).<sup>6</sup>

After nine months, it was already evident that the subjects taking the combination of vitamins K2 and D3 experienced a slower progression of the **Common Carotid Intima Media Thickness**, which is a good indicator of atherosclerosis, as well as a predictor of cardiovascular episodes and death. Specifically, the thickness of the carotid (major neck) arteries increased by **13.73%** in the group taking vitamin D3, but in the group taking both vitamins, it only increased by **6.32%**.<sup>6</sup> Remember that the group of subjects in this study have a tendency for an increased carotid intima media thickness as a result of calcium losses from bone.

In addition, subjects taking the combination of vitamins K2 and D3 showed a reduction in **carotid artery calcification score** in all patients except those with the highest scores at baseline.<sup>6</sup> This indicates that calcium was staying in the bones, where it belongs, and out of the arteries.

These results clearly indicated that **vitamin K2 does indeed reduce the progression of atherosclerosis**.<sup>6</sup>

### How It Works

The impact of vitamin K2 on atherosclerosis is due to its role in activating a group of proteins whose job it is to keep calcium in the bones and out of the arteries.<sup>3,5,9</sup>

In bones, vitamin K2 activates a specific protein called **osteocalcin**. When osteocalcin is activated by vitamin K2, it binds calcium tightly to bone minerals to create strong bones. In arteries, vitamin K2 activates a protein called **matrix Gla protein**. When matrix Gla protein is activated by vitamin K2, it prevents calcium from being deposited in arteries.<sup>3,10</sup>

When vitamin K2 is not present in sufficient enough quantities to activate these two proteins, the result is an increased risk for developing osteoporosis and atherosclerosis because of calcium loss from the bones.<sup>11,13</sup>

### High Praise

The findings from this recent Polish study were significant enough to merit published comments by other experts in the field.

The experts observed that patients in the combined vitamins K2 plus D3 arm of the study already had more severe kidney disease, despite being randomly assigned to the treatment groups. This means that the group taking vitamin K2 along with D3 succeeded **despite** a less favorable starting point compared with the group taking only vitamin D3.<sup>14</sup>

Of course, while chronic kidney disease is common and deadly, patients with the disease are far from the only ones at risk for cardiovascular disease and bone loss arising from insufficient vitamin K2 intake. But given their extreme risk, for those conditions, this patient population made an ideal test group to demonstrate the value of supplementation with both vitamin K2 and D3.

### Vitamin K2's Dual Benefits



The recent Polish study further validated previous studies demonstrating vitamin K2's heart- and bone-health benefits.

Numerous studies have shown that populations with higher daily vitamin K2 intake (more than **32 mcg**) have a **50%** reduction in the risk of death from cardiovascular disease compared to those with low intake.<sup>15</sup> Calculated another way, for every **10-mcg** per day-increase in vitamin K2 intake, the risk of coronary heart disease falls by **9%**.<sup>16</sup> In another study, women with the highest intake of vitamin K2 were found to be at a **20%** lower risk for coronary artery calcification compared with women who had the lowest intake levels.<sup>5</sup>

These benefits have been found to extend to bone health as well. Postmenopausal women taking **1,500 mg** of calcium along with **45 mcg** of vitamin K2 daily experienced an increase in bone mineral density and a **55.9%** reduction in *inactive* osteocalcin levels,<sup>15</sup> a marker reported to be elevated in osteoporotic patients and related to an increased hip fracture risk.<sup>16,17</sup> Another study showed that when **180 mcg** of vitamin K2 daily was given for 3 years, it increased the amount of *activated* osteocalcin, produced significant improvements in bone mineral content and density, and increased bone strength.<sup>18</sup>

### Western Diet is Deficient in Vitamin K2

The average American diet lacks enough vitamin K2—which is found primarily in organ meats, egg yolks, cheese, and in a Japanese staple dish of fermented soybean called natto—to properly activate those vitamin K-dependent proteins.<sup>3,19</sup> Compounding the problem, vitamin K2 deficiency worsens with advancing age.<sup>19</sup>

Fortunately, studies have shown that sustained vitamin K2 supplementation produces significant improvements in bone mineralization and strength and also in standard measurements of cardiovascular health.<sup>20</sup>

The take-home message is that supplementing with vitamin K2 is practically mandatory for the average American desiring both healthy bones and a healthy cardiovascular system.

### Summary

Vitamin K2 has the unique ability to activate proteins that send calcium to its proper destination, into bone, while simultaneously preventing calcium from being deposited in blood vessel walls.

A new study has shown that supplemental vitamin K2 can reduce the progression of arterial thickening and stiffening in a population of kidney disease patients, a group that notoriously has cardiovascular complications arising from excessive calcium deposition.

Thus, supplementation with vitamin K2 should be part of a daily longevity program for any aging adult interested in preserving both heart and bone health.

If you have any questions on the scientific content of this article, please call a **Life Extension®** Wellness Specialist at 1-866-864-3027.

#### HEALTH QUIZZES

Discover nutrients you need for optimal health

[Take a Quiz](#)

#### GENERAL HEALTH & WELLNESS

Healthy Starts Here

[Read More](#)

#### MAGAZINE SUBSCRIPTION

Stay informed with Life Extension Magazine®

[Subscribe Now](#)

#### LAB TESTS

From basic health panels to genetic testing

[Learn More](#)

#### WELLNESS SPECIALISTS

1-800-226-2370

This service is FREE

7:30 AM - 12 AM (ET) Mon-Fri | 9 AM - 12 AM (ET) Sat-Sun

[Learn More](#)

#### ADVERTISE IN THE MAGAZINE

Spread the word to Life Extension® customers

[Learn More](#)

#### STRESS AND BURNOUT STUDY

Feeling frazzled? Is stress keeping you up at night?

[Learn More and Apply](#)

