

# Osteoporosis

## Vitamin K2

**Vitamin K2 is the most critical nutrient when it comes to preventing osteoporosis** but it needs help from two other fat soluble vitamins: A and D. It also needs help from magnesium. Several studies have confirmed low vitamin K2 in patients with osteoporotic fractures. **Without Vitamin K2 we cannot build bone. Unfortunately, Vitamin K2 has decreased massively in our food supply and deficiency is widespread.** A British study from 2005 found Vitamin K2 intake in children had dropped from 39mcg daily in the 1950s to 24mcg daily in the 1990s. Another problem is few doctors **understand the central role of Vitamin K2 in preventing osteoporosis.**

Vitamins A and D produce the specialist bone-building protein **osteocalcin** and **this will only function if it is activated by Vitamin K2.** Those low in Vitamin K2 in one study had a 65% higher risk of hip fractures.

Just as important Vitamin K2 activates another protein, **matrix gla protein (MGP)** which removes calcium from soft tissues and arteries. **Without activated osteocalcin, calcium cannot get into our bones and teeth** and gets diverted to our arteries and soft tissue, increasing the risk of heart disease. **Without MGP we can't get calcium out of arteries** (mice with an inability to make MGP die rapidly from massive artery calcification). So, Vitamin K2 has a role in preventing both osteoporosis and heart disease (a Norwegian study in 2004 found women with low bone density had more calcified plaques in their arteries).

This is why calcium and Vitamin D supplements have not been shown to help restore bone density. They can't do this without Vitamin K2. Vitamin D has been shown to reduce fractures within the first year of taking it. This happens before bone density has changed and is probably due to its beneficial effect on muscle strength.

## Building Bone

Osteoblasts are cells that build bones and teeth. Together with Vitamins A and D that secrete osteocalcin. However, osteocalcin only works

after it has been activated by Vitamin K2 (or strictly speaking carboxylated by it). Only then will calcium be drawn into bone and teeth. **Without it calcium can end up in arteries instead which explains the known link between calcium supplementation and heart disease.** In fact, those with the highest intake of Vitamin K2 have 50% less heart disease (the Rotterdam study, 2004).

### Breaking down bone

Old bone needs to be broken down and replaced by new bone otherwise we end up with brittle bones. To demonstrate how necessary this is, the whole skeleton is replaced every 7 to 10 years. Osteoclasts are cells that break down bone. However, this needs to be done in a controlled way and Vitamin K2 reduces the number and activity of osteoclasts. In contrast, Vitamins A and D increase the number and activity of osteoclasts. This might seem like a bad idea but these vitamins all work together removing weakened bone where necessary in a balanced way to make way for stronger bone. We need all three of these vitamins to break down bone in the right way.

### Other Benefits of Vitamin K2

In a study from the Netherlands those with the highest intake of Vitamin K2 lived 7 years longer. In another study vitamin K2 was found to suppress growth in colon cancer cells. <https://doi.org/10.1016/j.canlet.2008.12.020> In animals K2 deficiency leads to type 2 diabetes and Vitamin K2 is known to increase insulin sensitivity.

### The Critical Role of Magnesium

It is known that women with lower magnesium in the diet have more osteoporosis and seven studies of osteoporosis in post-menopausal women have shown they have lower levels of magnesium. One study showed supplementing magnesium (250-750mg daily for 2 years) increased bone density without any other measure. Magnesium stimulates calcitonin which draws calcium into bone.

### Other Nutrients

Few people know that there is as much silica as calcium in bone and bone contains many other minerals. Other supplements that help bone formation are **silica** 200mg daily and **strontium** 250 -500mg daily (avoid the NHS strontium called strontium ranelate (Protelos or Protos) as it contains aspartame). **Boron** is also helpful for both bone building and

arthritis –take at least 3mg and up to 20mg daily. It concentrates in the parathyroid gland which produces the hormone parathormone which controls calcium metabolism.

**Copper** is also involved in building bone and draws calcium from the soft tissues into bone. The majority of people (70-80%) are low in copper. High levels of calcium can lower copper. See the leaflet on copper (not in alphabetical order) for more information. Almost 200 years ago the German physician Rademacher, found people with broken bones healed faster on copper supplements.

Weight-bearing exercise is also very important for strong bones.

### The Danger of Fluoride

**Flouride makes the bone more brittle and more liable to fracture.** One study found women with the highest third in consumption of fluoride had 59% more hip fractures.

<https://pubmed.ncbi.nlm.nih.gov/34251877/#:~:text=Environ%20Health%20Perspect,2021%20Jul%202012>. Another study found a 50% increase in hip fractures in women with the highest fluoride exposure

<https://doi.org/10.1289/EHP7404> The study also found these women's bones had increased mineral density (see below) despite being more susceptible to fracture. **When it comes to preventing fractures, it's not just about avoiding osteoporosis it's also about keeping away from fluoride.**

I would add it's also about improving balance as poor balance causes many falls and hence fractures.

### What Your Doctor May Give You

Most doctors give a **combination of calcium and Vitamin D** and, if the osteoporosis is marked, they give drugs called **biphosphonates** such as alendronic acid.

As mentioned **giving calcium is a mixed blessing** as it may end up in the wrong place if Vitamin K2 is deficient and increase the risk of heart disease. The EPIC study found those taking a calcium supplement had an 85% higher risk of heart attacks.

Vitamin D does reduce the fracture risk and will, with Vitamin A produce Osteocalcin. **But unless this is activated by Vitamin K2 it cannot complete the job of building bone.**

Biphosphonates stop bone breaking down. This is done by damaging osteoclasts **but, unlike Vitamin K2, they do nothing to build bone.** Also the bone is broken down in an unbalanced way (unlike what happens where Vitamin K2, Vitamin D and Vitamin A work as partners). This can cause brittle bones and, in time, **increase the risk of atypical fractures** (fractures which occur without trauma). They also **increase the risk of oesophageal cancer and osteonecrosis of the jaw**, a progressive, frightening and untreatable condition. (In the USA dentists won't do implants on patients on these drugs).

For any drug it is important to look at the benefits and weigh it against the risks. **Biphosphonates have slight benefits but these come with high risks.** Compare this with Vitamin K2 which has greater benefits and no known risks.

### Which Foods contain Vitamin K2

Vitamin K2 comes from purely animal sources. Most farm animal (and herbivores) can convert Vitamin K1 (which is found in plants) and convert it to K2. (Vitamin K1 plays no part in bone health). **We have virtually no capacity to do this conversion so we need to get K2 from animal sources.** In the past most Vitamin K2 came from foods like milk, butter, cheese and eggs. Unfortunately, due to modern farming methods, most animals are now fed on grains rather than grass and plants and even a small amount of grain in the diet greatly depletes Vitamin K2. Liver is still a good source as is egg yolk, wild game and hard cheeses. However, it is easy for Vitamin K2 to be virtually absent in the modern diet and depletion can occur within 7 days if it is absent.

### Which Vitamin K2 Supplement?

There are two types of Vitamin K2: MK-4 (menaquinone-4) supplements which are short-acting (needs to be taken three times daily) and MK-7 supplements which are longer-acting and can be taken daily. **MK-7 supplements have obvious advantages.** Take 90-120 mcg daily of MK-7 for routine use and double this if you have osteoporosis, menopausal or post-menopausal bone loss or heart disease or 45mg daily of the MK-4. Remember Vitamin K2 works in tandem with Vitamin D and A so supplement these as well (I would suggest 2000 to 4000 IU of Vitamin D daily and 5000 IU of Vitamin A daily). (In one study of 16,057 women, initially without cardiovascular disease, followed for 8 years, the risk of cardiovascular disease decreased by 9% for each 10mcg of MK-7 taken).

## Vitamin K2 and anticoagulants

Vitamin K2 interferes with warfarin, even at low dosages. In fact warfarin depletes Vitamin K2 and leads to arterial calcification. It is still possible to use the two together (and reduce arterial calcification) but this needs to be done with care using blood test to monitor the INR.

Other anticoagulants such as DOACs (direct acting anticoagulants), aspirin and clopidogrel are not thought to interact with Vitamin K2.

## Bone Density Scans

Dexa scans are used to measure bone density and gives a T score. However, remember bone density is not the only factor in fractures. The T score should be between 0 and -1. Osteoporosis is defined as -2.5 or less and osteopenia as -1 to -2.5.

Typically, the DEXA scan is repeated after a few years. As bone density changes very slowly: usually by only 1% in a year and the variation between two readings of a DEXA scan can be as much as 6% there is little point in repeating it after a year or two.