

Beyond Calcium

Five important nutrients for bone health



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Vitamin D

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- Vitamin D is necessary for your body to absorb calcium and phosphorus, the most abundant minerals in bones. Did you know that you probably can't get enough Vitamin D from food alone?
- Now you probably learned that sunlight exposure is critical and helps to top up your Vitamin D stores. But of course, there's a twist...
- You make Vitamin D when a dormant form of Vitamin D in your skin is exposed to sunlight. Exposure to the sun's UV ray initiates a cascade of events in which the dormant or inactive 7-dehydrocholesterol form of Vitamin D is transformed into the biologically active 1,25-dihydroxyvitamin D form.
- Multiple genes are involved in this stepwise process.

Once in its active form, Vitamin D must bind to its Vitamin D Receptor, also known quite simply as the VDR receptor

Only when Vitamin D binds to its receptor can it actively function in your body. And you guessed it, there's a gene for the receptor too!

Putting this all together, many of us have one or more genes that prevent us from taking advantage of the sunlight, because genetically we are poor Vitamin D convertors. *This means that while food sources of Vitamin D are really important, many of us may need Vitamin D supplementation to help get us to optimal levels.*

Who needs to take a supplement?

- Unless you know your Vitamin D number, you don't know. **Get your number and check it annually!**
- Individuals with darker skin may need more Northern states or climates with exposure to less sunlight and shorter days.
- Individuals who are unable to access the outdoors or cannot be outdoors regularly.

What is an optimal Vitamin D level?

The Institute of Medicine (IOM) recommends a baseline serum vitamin D target of 50 nmol/l



Vitamin K2

When it comes to bones, Vitamin K2 is really special. When we talk bones, we are interested in the form of Vitamin K2 called Menaquinone-7 or MK-7. We'll refer to our Vitamin K2 as MK-7 here.

Vitamin K2 or MK-7 activates a protein called osteocalcin. This protein is released by your bone cells, also known as osteoblasts.

Osteocalcin helps to secure or adhere calcium to your bone matrix. Think of MK-7 acts as a switch to ensure that calcium is directed to your bones

While MK-7 is so important for your bones, it also has a critical role in supporting your heart health.

MK-7 diverts calcium away from your blood vessels and into your bones. Without MK-7, excess calcium can be deposited into your blood vessel walls, possibly contributing to atherosclerosis.



Where to find K2 (MK-7)

- Fermented foods (we might also think of them as cultured)
- Kefir
- Kombucha
- Yogurt and aged (versus young) cheeses
- Traditional products such as tamari, soy, fish sauce and miso
- Naturally fermented products such as sauerkraut and kimchi

What is the optimal Vitamin K2-7 daily intake?

- The IOM has no established target daily value for MK-7 intake
- According to a paper in Osteoporosis International, 2013, post menopausal women taking 180 mcg/day for 3 years showed improved bone strength, and a decrease in the loss of vertebral height.
- A randomized control study conducted in Japan and published in 2015 showed that daily intake of MK-7 greater than 100mcg/day was instrumental in activating osteocalcin which is essential for bone quality.
- See references for details

www.bonerevolution





Protein

For strong bones, you need to eat sufficient calories and ensure you eat adequate protein.

Protein makes up approximately 30% of your entire bone mass.

Protein provides the critical collagen matrix for your bones and helps to maintain the complex of hormones and growth factors involved in bone production and turnover.

Bone is continuously turning over and remodeling or rebuilding itself. Your bones are an active living tissue that requires adequate protein on a daily basis to maintain their integrity and stability.

Protein is also needed to build and strengthen your muscles. Stressing, building and strengthening your muscles will in turn stress your bones in a healthy way. Stressed bones are strong bones. In this manner, bones and muscles work synergistically with each other.

Build bone and you build muscle. Lose muscle and you lose bone.

One of the nutritional concerns about protein is that too much can prompt your body to excrete calcium, thereby weakening your bones. The opposite may in fact be true. Too little dietary protein can actually reduce dietary absorption of calcium. This in turn activates the parathyroid hormone which is your master calcium regulator. And naturally this hormone wants to do its regulatory job and will tap your bones for calcium.

Your body will strive for balance at all costs.



Where to get your protein

- Animal and seafood, eggs and dairy.
- Robust plant sources include legumes, nuts and seeds

Optimal daily protein intake to maintain bone health?

- Protein intake absolutely depends on your current protein balance, health needs and also exercise demands.
- Understanding your protein requirements is important. Specific to bone health, your protein needs may vary depending on whether you are maintaining bone or rebuilding bone. Also whether you have any associated health issues such as kidney disease which can alter your protein requirements.
- In general, you can target 1.2 or 1.4 g/kg (minimum) of protein per day. 1 kg is approximately 2.2 pounds. **Your protein needs are unique however, so this is a guide. I strongly recommend you talk with a licensed expert in nutrition to determine your unique needs as your body may need more or less than this estimate based on your unique health situation and physiology**

If you weigh 140lbs, this equates to 76-89 grams of protein/day



Magnesium

Did you know that about 60% of the body's entire magnesium stores are found in your bones?

Magnesium is like zinc in that it quietly, but robustly influences hundreds of reactions and processes in your body. One of those processes is how you produce energy (ATP) to move and live!

Hydroxyapatite is the calcium-phosphate rich crystal molecule that gives your bones and teeth their rigidity. The smaller and more imperfect these crystals, the stronger your bones. Magnesium assists with the building and maintenance of hydroxyapatite. It is therefore a key team bone player.

Magnesium also helps stimulate the growth of bone cells.

Like calcium, if magnesium levels drop in the body, your bones will act as the storage closet, handing out magnesium (and calcium) to ensure your body stays in balance.

Studies have shown that increasing magnesium in the diet via either food or supplementation has increased bone mineral density and reduced bone turnover in women and men respectfully.



Where to get your magnesium

- To amp your magnesium, think plants versus animals.
- Look no further than nuts and seeds to get the most amount of magnesium per mouthful.
- Among legumes reach for black beans, kidney beans, edamame
- For veggies (well avocado is really a fruit!) avocados and spinach are good plant sources.

What is the optimal daily intake for magnesium?

The Recommended Dietary Allowance (RDA) for adults 19-51+ years is:

- 400-420 mg daily for men
- 310-320 mg for women





Collagen

In the protein section, we talked about collagen. Collagen is one way that protein contributes to bone structure and bone health.

Collagen makes up between 25 and 30% of our total dry bone weight!

Think of collagen as the backbone or matrix to which minerals and nutrients adhere, therefore creating your bone infrastructure

To build collagen, your body requires specific amino acids (protein) building blocks, namely glycine, proline and lysine. It also requires vitamin C.

Your body can actually produce glycine, providing you eat a wide variety of foods.

Proline and lysine must be obtained from your diet.

Finding collagen

In truth, animal and sea foods are the richest source of both lysine and proline per bite. This is where nose to tail cooking has rich benefits.

Home made bone broths made from bones and animal parts including feet provide gelatin which is very rich in collagen building nutrients.

If you prefer plant foods, target whole soybeans, sunflower or pumpkins seeds, seaweed products like Spirulina.

Vitamin C is easy-peasy. Just go for those fruits and vegetables



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This brochure was compiled with the expert insights of Alyssa Broadwater, MS, RD - Willow Health

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