

# Foods to support bone health



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## OVERVIEW OF BONES

Bones support and shape the body and protect delicate internal organs such as the brain, heart and lungs. Most bones also contain bone marrow, where blood cells are made.

At birth a baby's body has about 300 bones, which eventually fuse to 206 adult bones.

When you reach bone maturity, around the age of 25 new bone stops being made but existing bone is constantly remodelled.

Two main cells are responsible for bone remodeling.

**Osteoclasts** dissolve and remove unwanted old and damaged bone.

**Osteoblasts** form new bone.

The balance of bone formation and destruction determines **bone mineral density** & normally, our bodies are constantly doing this in a balanced way.

A decrease in bone mineral density (BMD) results in osteopenia, (lower bone density than the average for your age, but not low enough to be classed as osteoporosis) If the BMD continues to decline it leads to osteoporosis which results in weak bones.

Measuring bone density will provide a marker of bone health. Equally important is **bone quality** which is generally defined as the bone micro-architecture, any accumulated microscopic damage, the size of mineral crystals, and the quality of collagen.

## COLLAGEN

Key to bone health is the collagen matrix which is a bedrock of nutrients and minerals that allows the bone to expand, contract, and mend without breaking, forming a firm, yet flexible foundation which provides the skeleton and surrounding tissue with structure as well as strength.

Fortunately, the human body is well-designed and makes its own collagen when consistently given the nutrients it needs to do so.

Collagen, like all proteins, is made up of amino acids which are properly structured with the help of vitamin C. Without vitamin C, collagen is broken down and not replaced.

The main amino acids essential for collagen formation are glycine, lysine, L arginine and proline, all found in meat and fish as well as plant foods. Zinc activates the proteins responsible for making collagen, copper increases the production of collagen & anthocyanins suppress inflammation and stabilise collagen. Vitamin A & manganese help to increase production of collagen.

#### **Nutrients that support collagen production**

**glycine** - glycine is the primary amino acid found in collagen  
found in sesame, watercress, sea vegetables and pulses

**lysine** - lysine is used to make collagen and also protects collagen from breakdown.  
found in lentils, quinoa, sea vegetables & spirulina

**Larginine** - Larginine is essential for optimal collagen synthesis,  
found in pumpkin seeds, spirulina, sea vegetables, chickpeas

**proline and hydroxyproline** (produced by hydroxylation of proline) are vital for collagen biosynthesis, structure, and strength  
found in mushrooms, cabbage, asparagus, sea vegetables

**vitamin C** -broccoli, citrus, peppers

**zinc** - pumpkin seeds, raw chocolate, hemp

**copper** - sunflower seeds, mushrooms, lentils

**anthocyanins** - blackberries, red cabbage, red onions

**vitamin A** - sweet potatoes, carrots, kale

**manganese** - whole grains, green leaves, wakame

Cross-cultural studies show us that throughout the world, most individuals loose bone-mass as they age. This bone though lower in mass, should be able to with stand the stresses and strains of daily activity.

## **OSTEOPOROSIS**

Lower bone density than the average for your age is classified as osteopenia, but not low enough to be classed as osteoporosis. Osteopenia is the stage before osteoporosis, but it does not automatically lead to osteoporosis.

Osteoporosis is a disease characterized by low bone mass and microarchitectural deterioration of bone tissue, leading to an increased risk of fragility fractures.

Osteoporosis severely weakens bones, making them fragile and more likely to break. It develops slowly over several years and is often referred to as the 'silent killer' as, generally, it is only diagnosed when a fall or sudden impact causes a bone to break. In Britain osteoporosis has increased six fold in the past 30 years.

Osteoporosis is not a simple disorder. Many different factors contribute to a decline in bone health. It is more likely to affect older women, especially white and Asian, than men. Whilst declining testosterone levels can affect men's bone health, after menopause the impact of falling estrogen levels on women is more significant.

If estrogen levels decrease, osteoclasts become more active, and your body breaks down more bone than it replaces.

Certain medical conditions and some medications can accelerate the development of osteoporosis. Steroids slow down osteoblasts and speed up osteoclasts. They can also make it harder for your body to absorb calcium. Taking thyroid hormones can also create an imbalance between osteoblasts and osteoclasts. Chronic inflammatory diseases exert a negative influence on bone health.

High caffeine, alcohol & sugar consumption, smoking, an acid forming diet, lack of weight bearing exercise, chronic stress and minimal sunlight exposure are all risk factors for osteoporosis.

A lack of adequate nutrients can have a major impact on bone health. This could be due to poor food choices or the presence of a physical condition that affects the body's ability to absorb nutrients. Whatever the cause when there are insufficient nutrients for long periods of time bones will suffer. Healthy bone needs regular weight-bearing exercise and the right levels of various hormones. An adequate and constant supply of nutrients within a balanced diet is necessary for whole health.

Here are the key nutrients essential for bone health.

## **Calcium**

Calcium is essential for the development and maintenance of bone health. But how much? The amount of calcium needed will vary depending on a myriad of factors including digestive health & physical activity. Calcium depends on other nutrients to do its work, so just increasing calcium without other bone-building nutrients is not the answer to healthy bones.

**Green leafy vegetables, broccoli, Brussel sprouts & kale** are a good source of calcium as well as a broad range of vitamins and minerals that are important to maintaining healthy bones.

Other good sources of calcium include **sesame, hemp, and yogurt**.

## **Vitamin D**

Adequate Vitamin D levels are critical for calcium absorption in the intestines. Without enough vitamin D, less than 10% of ingested calcium may be absorbed. The body's use of vitamin D is enhanced in the presence of magnesium and boron. If you eat a plant based diet it is best to take a D3 supplement. Good sources **shiitake, eggs & oily fish**. (+sunlight!)

## **Boron**

Small amounts of this trace element can greatly enhance the absorption of calcium. Good sources **kelp, dulse, apples & green leafy vegetables**.

## **Magnesium**

Magnesium is responsible for many biochemical processes within the bone. Magnesium is essential for the conversion of vitamin D to its biologically active form. Good sources of magnesium include **legumes, nuts, seeds & green leafy vegetables**.

## **Vitamin K1**

Vitamin K1 is the form of vitamin K that is found in plants. It has an important role to play in anchoring calcium molecules and holding them in place within the bone. Good sources of vitamin K1 are **green leafy vegetables, cauliflower, broccoli**.

## **Manganese**

This trace mineral is essential for the mineralization of the bones as well as the production of cartilage and connective tissues. Good sources of manganese include **whole oats, blackberries & raspberries**.

## **B vitamins**

When blood levels of vitamin B6, vitamin B12 and folic acid are low, homocysteine levels can rise and interfere with collagen synthesis. Good sources - **cauliflower, lentils, dark green leafy vegetables & nutritional yeast with B12**

## **Bone support smoothie**

*serves 1*

1 handful (125g) frozen blueberries (*vitamin C, manganese*)

1 apple quartered, cored and chopped (*vitamin C, boron*)

1 handful kale, coarse stems removed, roughly torn (*calcium, magnesium, B6, K1*)

1 tablespoon shelled hemp seed (*protein, minerals and essential fatty acids*)

2 tablespoons live yogurt (*protein, calcium, probiotic*)

1 dessertspoon hazelnut butter (*folate*)

1 teaspoon raw cacao powder (*magnesium*)

knob of grated ginger (*anti-inflammatory*)

1 teaspoon shiitake powder (*vitamin D*)

1 teaspoon raw honey (optional)

Blend all together in a processor adding a little water to make the right consistency.

## **Flaxseed crackers**

Lignans and the essential fatty acid alpha-linolenic acid in flaxseeds can help regulate hormone levels, which is particularly useful for menopausal women. They also fight oxidative stress, help reduce inflammation and boost immune function and support bone health.

300ml carrot juice

175g linseed

1 teaspoon miso

Roughly grind 1/2 the linseed, tip into carrot juice with the whole seeds and leave for 30 minutes. Stir in the miso.

Using a spatula spread the mixture thinly onto 2 baking parchment lined dehydrator trays.

Dry in dehydrator at 45°C until set and becoming crisp. Flip the sheets over and peel away the paper. Place back onto tray and dehydrate until crispy. No dehydrator? Dry in a very low oven.

Break into pieces and store in an airtight container.

## **Potent Bone Builder Salad**

*serves 4*

200g shiitake mushrooms sliced  
2 tablespoons olive oil  
2 cloves finely chopped garlic  
1 tablespoon grated ginger  
handful chopped parsley  
1 tablespoon apple cider vinegar  
1 tablespoons light miso  
3 tablespoons olive oil  
1 head of broccoli broken into small florets  
1 handful soaked pumpkin seeds  
Handful of dulse soaked and chopped  
18 soaked almonds finely sliced  
4 handfuls of green salad leaves  
4 handfuls sprouted alfalfa  
4 tablespoons hulled hemp

Gently cook the shiitake in the oil. Mix the garlic, ginger, parsley, cider vinegar, light miso & olive oil together.

Stir in the shiitake and broccoli and leave to marinade for 30 minutes. Mix in the pumpkin seeds, dulse and sliced almonds.

Divide the salad leaves between 4 bowls add a handful of alfalfa & top with the broccoli mixture and finally the hemp seeds.

If you can find a sunny spot to enjoy this salad all the better.

## **Sprouted lentil, kale & hazelnut salad**

*serves 4*

4 handfuls kale, thick stalks removed and finely shredded  
1/2tsp salt  
juice of half a lemon  
4 handfuls sprouted green lentils  
1 tablespoon olive oil  
1 finely diced large shallot  
2 finely diced cloves of garlic  
1 teaspoon ground cumin  
2 tablespoons hazelnut butter  
1 tablespoon tamari  
1 tablespoon hemp seeds  
1 tablespoon sunflower seeds

Massage the kale with the salt for a minute then stir in the lemon juice  
Mix together the olive oil, shallots, garlic and cumin and mix into the lentils. Add the kale and divide between 4 bowls.

Mix the hazelnut butter and tamari together with enough water to make a thickish pouring consistency. Top each salad with the hazelnut butter hemp and sunflower seeds.

### **Collagen support tonic broth**

3 x strips kombu & a small handful dulse

6 shallots, chopped

150g shiitake

handful fresh parsley

1" knob turmeric, chopped

2 beetroot, peeled & chopped

½ small red cabbage chopped

handful kale - protein,

handful fresh coriander

teaspoon fennel seeds

1" knob of ginger, chopped

4 cloves garlic, chopped

3 litres water

large handful of nettles tops in spring & early summer (optional)

Place everything except the red cabbage in a pan and simmer gently for 45 minutes. Add the red cabbage and simmer for a further 15 minutes.

Strain the broth and store in the fridge (or freeze in ice cube trays, pop them out and store in a bag in the freezer).

Add 1 teaspoon miso and up to 1/2 teaspoon of spirulina to make a nourishing, supportive drink for healthy bones (+ skin, digestion & immunity!)



## **Winter slaw**

*serves 4*

½ red cabbage – very finely shredded  
250g Brussels sprouts – halved & very finely sliced  
4 celery sticks cut into fine slices  
6 tablespoons olive oil  
1 tablespoon lemon juice  
1 teaspoon Dijon mustard  
black pepper & salt  
handful flat leaf parsley - chopped  
handful of skinned almonds finely sliced

Place the red cabbage, Brussels & celery in a bowl.

Mix together the olive oil, lemon juice, mustard, salt & pepper and massage through the vegetables. Leave to stand for 1 - 3. Tip into a serving dish.

Top with parsley and almonds

## **Tahini cauliflower**

*serves 4*

1 tsp black peppercorns  
1 tblsp coriander seeds  
1 dstsp cumin seeds  
1 tsp cardamom seeds  
1 tsp paprika  
1 tsp turmeric  
1 large cauliflower  
2 tblsp olive oil

*Tahini dressing*

3 tblspn tahini

juice from 1 lemon

1 tblsp olive oil

1 tblsp water

½ tspn salt

oven 400 F 200 C gas mark 6

Toast the peppercorns, coriander and cumin in dry pan until aromatic.

Remove from the heat and grind in a pestle and mortar then add the cardamom, paprika and turmeric.

Cut the cauliflower into florets and the stem into slices and place in a bowl , add the olive oil and spice mix then using your hands rub together well.

Tip on to a baking tray and roast in the oven for 15 minutes until just tender.

Whilst the cauliflower is cooking make the tahini sauce by mixing all the ingredients together, adding more water if necessary to make a pourable sauce. Tip the roast cauliflower into a bowl and spoon over the tahini sauce.

Optimal human health comes from eating nutrient dense foods produced and processed in ways that maximise both the quality and quantity of nutrition.

Ecological health is integral to human health. Food grown using nature based, regenerative farming practices, manage sustainably the complex interactions between water, energy and food, thus protecting and enhancing the environment whilst producing nutritious food.

- buy organic food whenever you can
- eat seasonally
- source your food as locally as possible
- join a box scheme
- grow your own (garden, allotment or community garden)
- support food & farming campaigning organisations

## **Resources**

### **Effects of phytoestrogens on BMD during the menopause**

<https://www.tandfonline.com/doi/abs/10.1080/13697137.2016.1238451?>

### **bone health testing**

<https://www.centralcarolinaortho.com/Blog/374362/>

<https://www.osteoscanuk.com>

<https://www.nhs.uk/conditions/dexa-scan/>

### **water-energy-food nexus**

<https://www.frontiersin.org/articles/10.3389/fenvs.2019.00008/full>

### **box schemes**

<http://bit.ly/3I1RWdh>

**Sustainable food trust** - <https://sustainablefoodtrust.org>

**LWA** - <https://landworkersalliance.org.uk>

**Oxford Real Farming Conference** <https://orfc.org.uk>

Daphne Lambert is an eco-nutritionist focusing on the interactions between agriculture, ecology and human nutrition.

Greencuisine Trust works to bring about a transformation in the way we eat. Through practical food experiences the Trust highlights the connections between our well-being, natural resources, the environment, and our planet.



Greencuisine Trust

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