

Bone Health (Functional)

Biohacker Report

REPORT CATEGORY —



BONE HEALTH

Sample Client

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DISCLAIMER

This report does not diagnose this or any other health conditions. Please talk to a healthcare professional if this condition runs in your family, you think you might have this condition, or you have any concerns about your results.

Personal information

NAME

Sample Client

SEX AT BIRTH

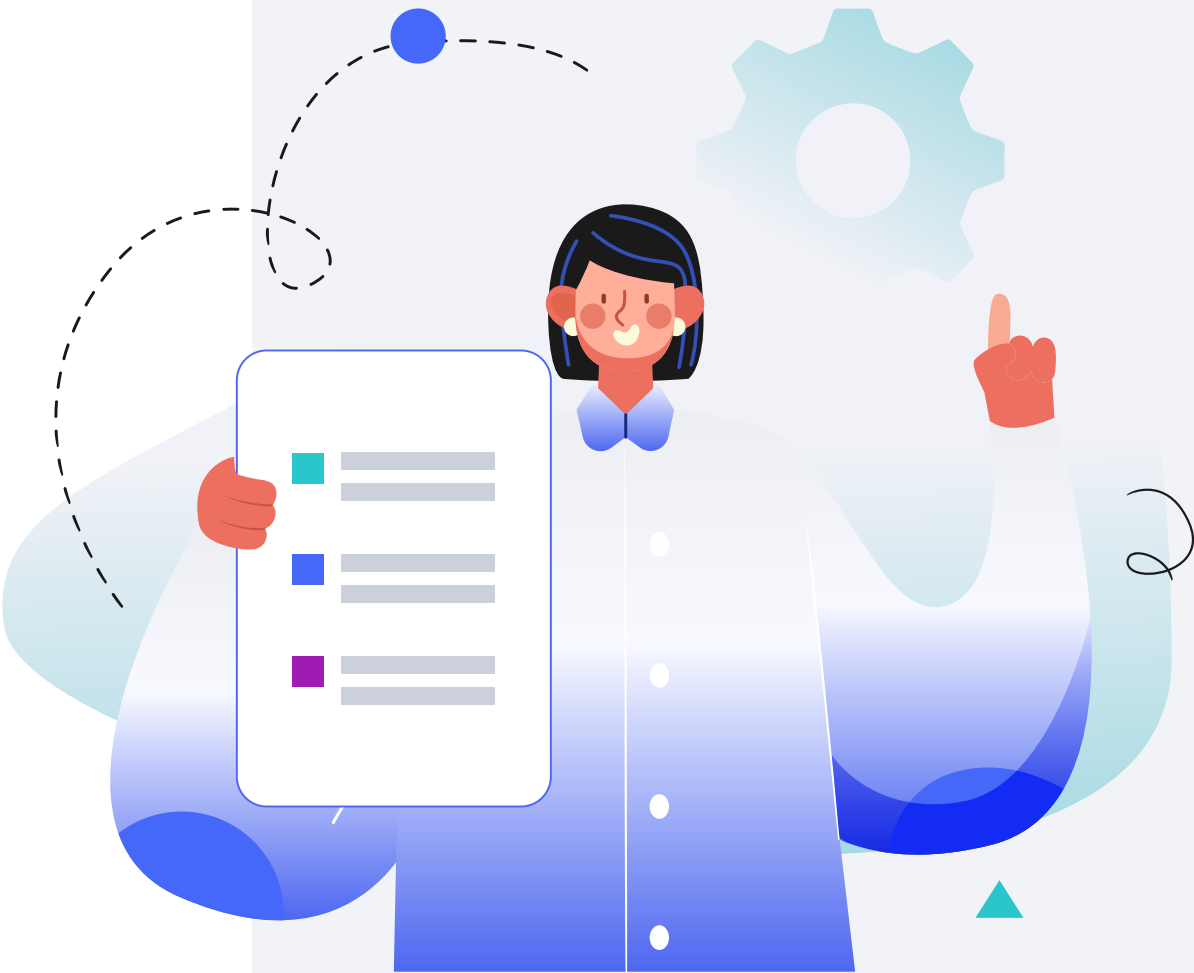
Male

HEIGHT

5ft 5" 165cm

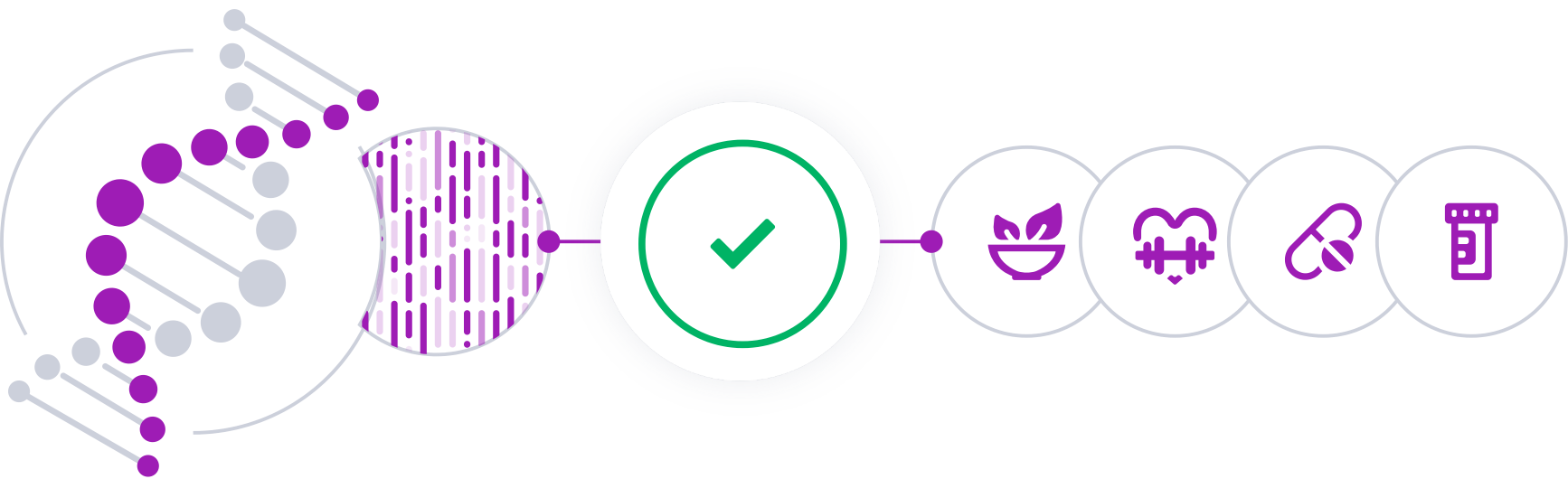
WEIGHT

137lb 62kg



How this works

Our Wellness Reports analyze how your DNA influences your health.
We then use this analysis to give you personalized risk estimates and recommendations.

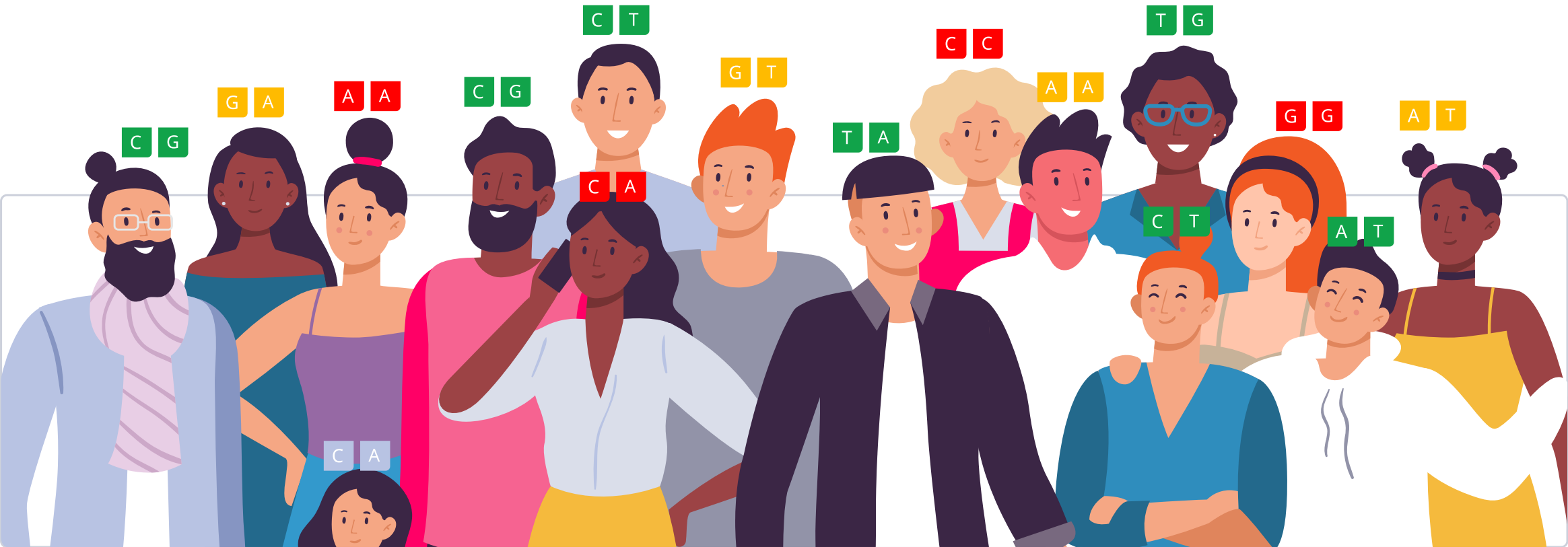


Similarly, our Trait Reports look at how your DNA influences your traits.



Your DNA is like an instruction manual — it contains a lot of information.
You can think of it as a blueprint for your body.

Genetic variants are parts of DNA that differ from person to person. Some can make you more vulnerable to certain health issues, while others may influence traits such as eye color.



We use artificial intelligence and machine learning to analyze all this information.
We then summarize your results as a risk score or display it on a gauge.

In total, we analyze up to 83 million genetic variants.

When we give a risk score, the risk icon tells you if you are at a higher or lower risk compared to other people:



Genotype color info:

AA

You don't have any risk alleles

AA

You have 1 risk allele

AA

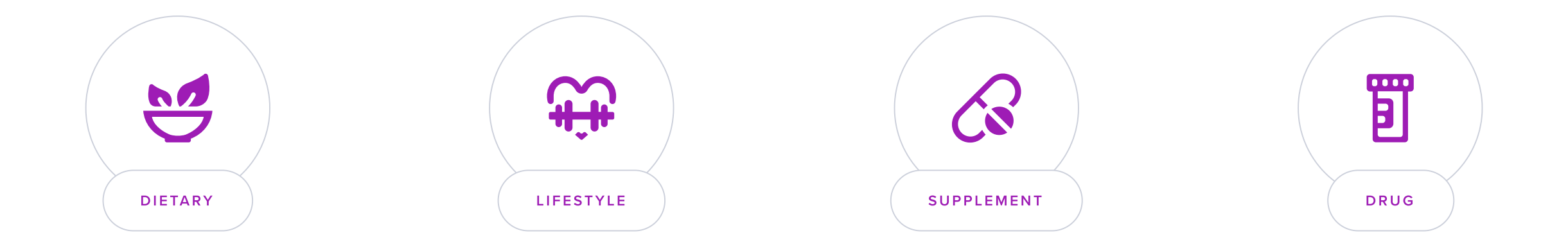
You have 2 risk alleles

Your risk is also displayed as a percentile. This will tell you how your risks compare to our sample population. The lower your percentile number, the lower your risk. The "50th percentile" would be an average risk.

Similarly, the gauge tells you your relative risk score compared to our sample population, or it indicates a specific trait or haplotype you are more likely to have based on your genetic variants.

When applicable, we also list top evidence-based recommendations that may help lower your risk. The focus is on recommendations that may be of benefit to you, based on your genetics.

Our recommendations come in four categories: lifestyle, diet, supplements and drugs.
The following icons tell you which category a recommendation falls into:



Our team of scientists also ranks each recommendation.
We rank based on impact and the strength of evidence in the medical literature.

Impact shows how strongly a recommendation will affect your health in a certain area.
Evidence is how much scientific support there is for the recommendation. Rankings are from 1 to 5 (low to high):



Impact

Impact scores range from 1-5. These scores reflect how much of an effect each recommendation can have. An impact score of 5 predicts the biggest effect.

When a recommendation affects something we can measure, we use those measurements to assign the impact score. For example, a recommendation that decreases cholesterol by 20% will have a higher impact score than one that decreases it by 5%.

Some recommendations affect things that we cannot directly measure, like stress or mood. For these, the impact score is based on how well they work relative to other recommendations and standard treatments. The best ones get the highest scores.

If there is a lot of research that shows a recommendation works especially well for your genotype, the impact score gets increased.

Recommendation Evidence

- 5 / 5
- Recommendations that are considered effective and generally recommended by experts and medical bodies.
-
- 4 / 5
- Recommendations that are considered likely effective and that have multiple independent meta-analyses and a great many studies supporting them.
-
- 3 / 5
- Recommendations that are considered possibly effective and have many studies supporting them
-
- 2 / 5
- Recommendations that have insufficient evidence, with two or several clinical trials supporting them, or many studies but with ambiguous results.
-
- 1 / 5
- Recommendations that have insufficient evidence, with a single clinical trial, or with many studies most of which didn't find support for the recommendation.
-
- 0 / 5
- No evidence in humans.

Genotype-specific Evidence

- High-quality
- Direct evidence that a recommendation helps more in people with your gene variant (many clinical trials, a few large clinical trials, or a meta-analysis).
-
- Medium-quality
- Direct evidence that a recommendation helps more in people with your gene variant (a few clinical trials or one large clinical trial).
-
- Low-quality
- Direct evidence that a recommendation helps more in people with your gene variant (a single clinical trial or more trials with inconsistent results).
-
- Indirect
- A recommendation may help more in people with your gene variant because it targets a specific gene or protein affected by your variant (e.g., MTHFR, dopamine).
-
- In theory
- A recommendation may help more in people with your gene variant because it targets a specific mechanism affected by your variant (e.g., inflammation, oxidative stress).

Some things to keep in mind:

- Genetics doesn’t play a considerable role in a condition or a trait.
- There is not enough research available to estimate a genetic predisposition.
- There are technical limitations to estimating or presenting a genetic predisposition.
- The topic is sensitive, and a genetic predisposition should only be estimated and presented by a healthcare professional.

Introduction

Bones provide essential structural support and protection for the body while serving as a reservoir for key minerals such as calcium and phosphorus, which are vital for various bodily functions.

Bone health relies on a dynamic balance between bone formation and resorption (breakdown), processes that are constantly regulated to adapt to changes in the body’s needs and environment. This balance is influenced by genetics, which affects how efficiently bones build and maintain their density, as well as the body's ability to absorb and utilize minerals.

Lifestyle factors such as diet, physical activity, and exposure to sunlight (vitamin D production) also play critical roles in supporting strong bones. Understanding genetic predispositions related to bone turnover and mineral metabolism can help identify specific needs and strategies to promote optimal bone health throughout life.

Genetics

Functional variants that shape your genetic predisposition for bone health include:

- **CYP2R1 (rs10741657, A>G):** This gene plays a role in the metabolism of vitamin D, which is essential for calcium absorption and bone health. The rs10741657 variant can influence how effectively vitamin D is activated in the body, impacting bone density and strength.
- **GDF5 (rs143383, 5'UTR C>T):** GDF5 is involved in joint and bone development. Variants like rs143383 can affect the production of proteins that support bone formation and repair, influencing bone structure and resilience.
- **DIO2 (rs225014, Thr92Ala T>C):** This gene regulates thyroid hormone activity, which affects bone turnover. The rs225014 variant (Thr92Ala T>C) can influence the balance between bone formation and resorption, potentially impacting bone density.
- **VDR (rs1544410, BsmI G>A):** The VDR gene encodes the vitamin D receptor, which is crucial for calcium regulation and bone metabolism. The rs1544410 variant (BsmI G>A) can affect how the body responds to vitamin D, influencing bone mineral density.
- **COL1A1 (rs1800012, 1546 G>T):** COL1A1 encodes collagen, a key structural protein in bones. The rs1800012 variant (1546 G>T) is associated with differences in bone strength and susceptibility to fractures.
- **VDR (rs2228570, FokI T>C):** Another variant in the VDR gene, rs2228570 (FokI T>C), impacts the activity of the vitamin D receptor, influencing calcium metabolism and bone density.
- **VDR (rs731236, TaqI T>C):** This variant in the VDR gene affects vitamin D receptor function. The rs731236 variant (TaqI T>C) can alter bone mineralization efficiency and contribute to variations in bone health.

These genetic insights can provide a deeper understanding of individual bone health needs, allowing for tailored dietary, supplement, and lifestyle strategies to optimize bone strength and reduce the risk of bone-related conditions.



Predisposed to worse bone health based on 9 genetic variants we looked at

Your top variants that most likely impact your genetic predisposition:

GENE	SNP	GENOTYPE
COPB1	rs10741657	GG
CPNE1	rs143383	AA
COL1A1	rs1800012	AC
VDR	rs2228570	GA
ALDH7A1	rs13182402	GA
TNFRSF11B	rs2073618	GC
VDR	rs1544410	CT
VDR	rs731236	AG
DIO2	rs225014	TT

The number of "risk" variants in this table doesn't necessarily reflect your overall result.

Your Recommendations

Your recommendations are prioritized according to the likelihood of it having an impact for you based on your genetics, along with the amount of scientific evidence supporting the recommendation.

You’ll likely find common healthy recommendations at the top of the list because they are often the most impactful and most researched.

DOSAGE		DOSAGE			
1	Exercise At Least One Hour a Day	1 hour	2	Dietary Calcium	
3	Maintain Optimal Vitamin D Levels	1000 iu	4	Vitamin D and Calcium	
5	Calcium Supplements	1000 mg	6	Strontium Citrate	125 mg
7	Soy		8	Anti-Inflammatory Diet	
9	Vitamin C	2000 mg	10	Vitamin K	90 mcg
11	Dietary Protein		12	Zinc	15 mg
13	Tea		14	Dietary Omega-3 Fatty Acids	
15	Magnesium	350 mg			

1



Exercise At Least One Hour a Day

IMPACT

4 / 5

EVIDENCE

5 / 5

How to implement

Dedicate a minimum of 60 minutes to moderate-intensity activities such as brisk walking, swimming, or cycling. Do this most days of the week, aiming for at least 5 days to optimize benefits.

TYPICAL STARTING DOSE

1 hour

Description

[Exercise](#) can do wonders for your health. It can help you lose weight, improve your heart health, boost your mood, and more [\[R\]](#).

There are many ways you can be active. You can walk, run, swim, dance, or play team sports. **Everything counts, and it's never too late to start!**

Try to get at least **60 minutes of moderate physical activity on most days**, including walking. **Getting a mix of cardio (min 150 min/day) and strength training (min 2 times a week) may be optimal.**

How it helps

Experts agree that exercise may help prevent osteoporosis. It may also reduce pain and improve function in those who already have the disease [\[R, R, R, R, R, R\]](#).

It may also reduce the risk of bone fractures [\[R, R\]](#).

Exercise may help by increasing bone mineral density [\[R, R, R, R, R, R, R, R, R\]](#).

Types of exercise that may support bone health include:

- Aerobic exercise [\[R, R, R, R, R\]](#)
- Resistance exercise [\[R, R, R\]](#)
- High-impact exercise (e.g., jumping) [\[R, R, R, R\]](#)

Combinations of the above exercises may also help [\[R, R, R, R\]](#).

2



Dietary Calcium

IMPACT

4 / 5

EVIDENCE

5 / 5

How to implement

Consume 1,000-1,200 mg of calcium daily through dietary sources such as dairy products (milk, yogurt, cheese), green leafy vegetables (kale, broccoli), and fortified foods (orange juice, plant-based milks). Adults under 50 need 1,000 mg per day, while those over 50 should aim for 1,200 mg per day.

Description

Dietary calcium is a mineral found in dairy products, leafy greens, and fortified foods. It is essential for bone health, muscle function, and nerve transmission.

[Calcium](#) is the most abundant mineral in the human body. It is vital for the bones, heart, muscles, and nervous system [\[R\]](#).

Your body gets calcium from food and needs vitamin D to help absorb it. Calcium can be found in a variety of foods, including [\[R\]](#):

- Dairy products
- Green, leafy vegetables
- Fish with edible soft bones (e.g., sardines)
- Calcium-fortified foods and beverages

How it helps

Experts recommend getting enough calcium throughout life, as part of a healthy diet, to help reduce the risk of osteoporosis [\[R, R, R, R\]](#).

Calcium is the main mineral that builds the bones and keeps them strong [\[R, R, R, R\]](#).

Getting more calcium may slow the rate of bone loss in older adults. The effect on fracture prevention is less clear [\[R, R, R, R, R, R, R, R, R\]](#).

Calcium combined with vitamin D appears to be more helpful than calcium alone in preventing fractures. However, increased intake from supplements did not always show a benefit [\[R, R, R, R, R, R, R, R\]](#).

Dairy products are rich in calcium. They may help strengthen the bones and reduce the risk of osteoporosis and fractures. However, not all studies found a benefit [\[R, R, R, R, R, R, R, R\]](#).

In addition to calcium, dairy contains other nutrients important for healthy bones. These include [\[R, R\]](#):

- Vitamin D
- Magnesium
- Protein



PERSONALIZED TO YOUR GENES

In people with your [VDR](#) gene variant, optimal calcium intake may be particularly important for strong bones [\[R\]](#), [\[R\]](#), [\[R\]](#). Increased calcium intake may reduce the negative effects of your [LRP5](#) gene variant on bone health [\[R\]](#).

YOUR GENETIC VARIANTS

GENE	SNP	GENOTYPE	EVIDENCE
VDR	rs1544410	CT	
GENE	SNP	GENOTYPE	EVIDENCE
LRP5	rs4988321	AG	

3



Maintain Optimal Vitamin D Levels

IMPACT

4 / 5

EVIDENCE

5 / 5

How to implement

Check your vitamin D levels, they should ideally be in the 30-66 ng/mL range. If your levels are lower than that, take a vitamin D supplement, 1000-4000 IU daily, to reach an optimal range.

TYPICAL STARTING DOSE

1000 iu

Description

Vitamin D, often referred to as the "sunshine vitamin," can be synthesized by the skin when exposed to sunlight, as well as being found in fish, eggs, and fortified milk. It helps regulate calcium absorption, promoting strong bones and a healthy immune system. Vitamin D deficiency can lead to conditions like rickets in children and osteoporosis in adults.

Your body needs [vitamin D](#) for strong bones. Vitamin D also plays a role in [\[R\]](#):

- Mood
- Immunity
- Heart health
- Blood sugar control

[Sunlight](#) is our main source of vitamin D. Experts recommend getting at least **5-15 minutes of midday sun, 2-3 times per week**. People with darker skin and those living at high latitudes may need longer periods of sun exposure [\[R, R\]](#).

Foods like fish, eggs, and fortified milk provide small amounts of vitamin D. **People lacking vitamin D should consider taking a supplement** [\[R\]](#).

How it helps

Low levels of vitamin D may increase the risk of fractures [\[R, R\]](#).

In line with this, **getting more vitamin D** may support bone health and decrease fracture risk. [\[R, R, R, R, R, R, R\]](#).

Experts recommend vitamin D supplements for people who can’t get enough from sunlight. Supplement doses between **600-2,000 IU/day** appear to help the most. **However, some studies found benefits only in people who were deficient** [\[R, R, R, R, R, R\]](#).

In addition, **some studies show that vitamin D supplements may help when combined with calcium or vitamin K**. Other studies found no benefit [\[R, R, R, R, R\]](#).

Vitamin D may help support bone health by [\[R, R, R\]](#):

- Increasing calcium and phosphorus absorption from food
- Increasing calcium levels in bones
- Promoting bone formation

Please note: *Medical bodies recommend against taking more than 4,000 IU per day. Extremely high doses may have negative effects on bone strength* [\[R, R\]](#).

 PERSONALIZED TO YOUR GENES

People with your **GC** variant may have lower vitamin D levels. For this reason, they may have weaker bones [\[R, R\]](#). Make sure to get enough vitamin D to maintain strong bones.

GENE	SNP	GENOTYPE	EVIDENCE
GC	rs7041	AC	

4



Vitamin D and Calcium

IMPACT

4 / 5

EVIDENCE

4 / 5

How to implement

Take 600 IU of vitamin D and 1000 mg of calcium daily. For adults over 70 years, the vitamin D intake should be increased to 800 IU daily. These supplements can be taken together or separately, usually with a meal to enhance absorption, and it is advisable to continue this regimen as part of your daily routine indefinitely unless advised otherwise by a healthcare provider.

Description

Vitamin D plus calcium supplements typically combine vitamin D, often sourced from sunlight exposure or dietary sources, with calcium, primarily found in dairy products and leafy greens. This combination is used to promote bone health, reduce the risk of osteoporosis, and support overall musculoskeletal well-being.

How it helps

Calcium combined with vitamin D appears to be more helpful than calcium alone in preventing fractures. However, increased intake from supplements did not always show a benefit [\[R, R, R, R, R, R, R, R\]](#).

Calcium is the main mineral that builds the bones and keeps them strong [\[R, R, R, R\]](#).

Vitamin D may help support bone health by [\[R, R, R\]](#):

- Increasing calcium and phosphorus absorption from food
- Increasing calcium levels in bones
- Promoting bone formation

Please note: Medical bodies recommend against taking more than 4,000 IU per day. Extremely high doses may have negative effects on bone strength [\[R, R\]](#).

5



Calcium Supplements

IMPACT

4 / 5

EVIDENCE

4 / 5

How to implement

Take 500-600 mg of calcium supplement twice daily with food. For best absorption, do not exceed 600 mg at one time and ensure a total daily intake of 1000-1200 mg from all sources, including diet. Continue indefinitely for ongoing support of bone health.

TYPICAL STARTING DOSE

1000 mg

Description

Calcium supplements are commonly used to support bone health and prevent conditions like osteoporosis. Adequate calcium intake is essential for maintaining strong bones and teeth.

[Calcium](#) is the most abundant mineral in the human body. It is vital for the bones, heart, muscles, and nervous system [\[R\]](#).

Your body gets calcium from food and needs vitamin D to help absorb it. Calcium can be found in a variety of foods, including [\[R\]](#):

- Dairy products
- Green, leafy vegetables
- Fish with edible soft bones (e.g., sardines)
- Calcium-fortified foods and beverages

How it helps

Experts recommend getting enough calcium throughout life, as part of a healthy diet, to help reduce the risk of osteoporosis [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#).

Calcium is the main mineral that builds bones and keeps them strong [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#).

Getting more calcium may slow the rate of bone loss in older adults. The effect on fracture prevention is less clear [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#).

Calcium combined with vitamin D appears to be more helpful than calcium alone in preventing fractures. However, increased intake from supplements did not always show a benefit [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#).

Please note: calcium competes with iron for absorption in the intestines, potentially exacerbating anemia or making it harder to manage. If you have anemia, consult your healthcare provider before using calcium supplements.

6



Strontium Citrate

IMPACT

4 / 5

EVIDENCE

3 / 5

How to implement

Take at least 125 mg of strontium citrate daily, preferably on an empty stomach before bedtime to optimize absorption. It is recommended to continue this supplementation for at least 3 months to evaluate its effectiveness.

TYPICAL STARTING DOSE

125 mg

Description

Strontium citrate is a dietary supplement that may support bone health by increasing bone density and reducing the risk of fractures. It is sometimes used as an alternative to calcium supplements for individuals with osteoporosis.

How it helps

Six meta-analyses (the largest one with 107 trials and 193,987 postmenopausal women) identified strontium ralenate among the drugs helping with osteoporosis. However, other drugs such as zoledronate, romosozumab, abaloparatide, or teriparatide were more effective. A Cochrane review of 4 trials found silver-level evidence that strontium ralenate (0.5-2 g/day for treatment and 0.125-1 g/day for prevention) reduces vertebral fractures (by 37%) and non-vertebral fractures (by 14%) while increasing BMD in postmenopausal women. A meta-analysis of 2 trials also concluded that strontium ralenate reduces the risk of both vertebral and non-vertebral fractures in postmenopausal osteoporosis [\[R, R, R, R, R, R, R, R\]](#).

Strontium citrate aids in strengthening bones and increasing bone density by stimulating the creation of new bone cells. This supplement, therefore, is beneficial for individuals with low bone mass such as those with osteoporosis.

7



Soy

IMPACT

4 / 5

EVIDENCE

3 / 5

How to implement

Incorporate soy-based products such as tofu, soy milk, and edamame into your daily diet. Aim for at least one serving per day, equivalent to about a cup of soy milk, a half-cup of cooked soybeans, or a 3-ounce piece of tofu.

Description

Soy is a legume native to East Asia, and its health benefits include being a source of plant-based protein, fiber, and various vitamins and minerals. It is known for its potential to support heart health, reduce cholesterol levels, and provide essential nutrients in vegetarian and vegan diets.

Soy is a common food in many cuisines around the world, especially Asian cuisines [\[R\]](#).

It’s a great source of [\[R\]](#), [\[R\]](#):

- Plant-based protein
- Fiber
- Omega-3 fats
- Antioxidants (isoflavones)

Soy-based foods include [\[R\]](#):

- Soy beverages
- Tofu
- Tempeh
- Edamame
- Miso
- Natto

Soy protein and soy isoflavones are also available as supplements.

How it helps

Eating more soy or supplementing with soy isoflavones may strengthen the bones. However, not all studies found a benefit [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#).

Soy isoflavones mimic estrogen in the body. Estrogen is a sex hormone that helps protect bones. Thus, soy may help prevent bone loss. It may be especially helpful for women after menopause [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#).

 PERSONALIZED TO YOUR GENES

Eating more soy may reduce the negative impact of your [VDR](#) gene variant on bone strength [\[R\]](#), [\[R\]](#).

YOUR GENETIC VARIANTS			
GENE	SNP	GENOTYPE	EVIDENCE
VDR	rs1544410	CT	

8



Anti-Inflammatory Diet

IMPACT

3 / 5

EVIDENCE

3 / 5

How to implement

Incorporate foods rich in omega-3 fatty acids, such as salmon and flaxseeds, fruits, vegetables, nuts, and whole grains into your daily meals. Avoid processed foods, red meats, and refined sugars. Aim for a balanced diet consisting mostly of plant-based foods and lean protein sources, adjusting portions sizes to meet your individual nutritional needs and health goals.

Description

An anti-inflammatory diet focuses on reducing inflammation in the body by emphasizing foods rich in anti-inflammatory compounds, such as fruits, vegetables, fatty fish, nuts, and seeds, while minimizing processed foods and those high in added sugars and trans fats.

Anti-inflammatory diets use healthy foods to reduce inflammation. These diets are generally high in [\[R\]](#), [\[R\]](#), [\[R\]](#):

- Colorful fruits and vegetables
- Nuts and seeds
- Fish
- Olive oil
- Tea

They also tend to restrict [\[R\]](#), [\[R\]](#):

- Processed food
- Sugar and refined carbs
- Red meat

The [Mediterranean diet](#) and the DASH diet are good examples of anti-inflammatory diets [\[R\]](#), [\[R\]](#).

How it helps

Some diets tend to increase inflammation and weaken the bones. One example is the Western diet, which is high in processed foods. People who eat these diets may have a **higher risk of osteoporosis and fractures** [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#).

On the other hand, an anti-inflammatory diet may support bone health. **The Mediterranean diet** is a good example. It may **strengthen the bones and prevent fractures** [\[R\]](#), [\[R\]](#), [\[R\]](#), [\[R\]](#).

9



Vitamin C

IMPACT

3 / 5

EVIDENCE

3 / 5

How to implement

Take 500-2000 mg of vitamin C supplement daily. It can be taken at any time of the day, with or without food, according to personal preference or tolerance.

TYPICAL STARTING DOSE

2000 mg

Description

[Vitamin C](#) is an essential nutrient. This means that our bodies can’t produce it on their own, so we have to get it from food or supplements [\[R\]](#).

Foods rich in Vitamin C include: [\[R\]](#)

- Citrus Fruits
- Peppers
- Brussel sprouts
- Kiwi
- Broccoli
- Tomato
- Cantaloupe
- Cauliflower
- Spinach

Vitamin C has antioxidant properties. It supports immunity, heart health, and wound healing [\[R\]](#), [\[R\]](#).

Vitamin C deficiency is called *scurvy*. In the past, many sailors suffered from it [\[R\]](#).

How it helps

Getting more vitamin C may increase bone mineral density and help prevent osteoporosis. However, it may not help heal fractures [\[R\]](#), [\[R\]](#).

Vitamin C helps make collagen. This protein is essential for bone health [\[R\]](#).

 PERSONALIZED TO YOUR GENES

Your [COL1A1](#) gene variant is linked to weaker bones and higher odds of osteoporosis. It likely reduces collagen production. Vitamin C may help by boosting collagen production [\[R\]](#), [\[R\]](#), [\[R\]](#).

YOUR GENETIC VARIANTS			
GENE	SNP	GENOTYPE	EVIDENCE
COL1A1	rs1800012	AC	

How to implement

TYPICAL STARTING DOSE

90 mcg

Description

Vitamin K is essential for blood clotting and bone formation [R].

Good sources of vitamin K include [[R](#), [R](#)]:

- Green leafy vegetables, such as kale, spinach, and collards
- Soy products, such as natto, roasted soybeans, and edamame
- Carrot juice
- Pumpkin

Healthy adults should get **120 micrograms** of vitamin K per day [R].

How it helps

Some people with poor bone health tend to have lower blood levels of vitamin K. Higher blood levels of vitamin K are linked to a lower risk of fractures [R, R, R, R, R, R, R, R, R].

[illegible]

Vitamin K may help by [\[R\]](#):

- Activating a protein essential for building bones
- Increasing calcium levels

Please note: Vitamin K can interact with blood thinners (e.g., Coumadin). Make sure to consult your doctor before supplementing with vitamin K or drastically changing your dietary intake.

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Dietary Protein

IMPACT

3 / 5

EVIDENCE

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How to implement

Include a variety of protein sources such as meat, fish, eggs, dairy, beans, and nuts in your diet every day, aiming for at least 0.8 grams of protein per kilogram of body weight. For more active individuals or those looking to build muscle, increase intake to 1.2 to 2.0 grams per kilogram of body weight daily, spread out over all meals to maximize absorption.

Description

Protein is essential for building and repairing tissues, supporting muscle growth, and maintaining overall bodily functions. Adequate protein intake is crucial for overall health and well-being.

Foods that are high in protein include:

- Eggs
- Nuts
- Beef
- Chicken
- Fish
- Yogurt
- Tofu
- Pork
- Cottage cheese

How it helps

Following a high-protein diet may protect against bone loss in people trying to lose weight. However, benefits may be limited [\[R, R, R, R, R\]](#).

In addition, supplementing with protein may not support bone strength in older adults [\[R, R\]](#).

Both vegetarian and vegan diets are associated with lower bone mineral density. These diets may be lower in nutrients that keep the bones strong, such as [\[R, R, R, R\]](#):

- Calcium
- Omega-3s
- Protein

Try to consume a variety of plant- and animal-based proteins for optimal bone health [\[R, R\]](#).

 PERSONALIZED TO YOUR GENES

In people with your [NADSYN1](#) gene variant, optimal protein intake may be particularly important for strong bones [\[R\]](#).

YOUR GENETIC VARIANTS			
GENE	SNP	GENOTYPE	EVIDENCE
KRTAP5-7	rs7944926	AA	

12



Zinc

IMPACT

3 / 5

EVIDENCE

3 / 5

How to implement

Take a 15 mg zinc supplement daily, ideally with a meal to enhance absorption.

TYPICAL STARTING DOSE

15 mg

Description

Zinc is an essential mineral found in various foods, including meat, dairy, and nuts. It is crucial for immune function, wound healing, DNA synthesis, and maintaining healthy skin and nails. Zinc supplements are sometimes used to support immune health and manage zinc deficiencies.

[Zinc](#) is an essential mineral. Your body needs it to [\[R\]](#), [\[R\]](#):

- Defend against disease
- Protect DNA from damage
- Heal wounds
- Control blood sugar

Some of the best sources of zinc include **shellfish, pork, beef, and beans**. It is also available as a supplement [\[R\]](#).

Adults should get **8-11 mg of zinc** per day [\[R\]](#).

How it helps

A diet low in zinc may increase bone loss. In line with this, low blood zinc levels may be linked to osteoporosis [\[R\]](#), [\[R\]](#), [\[R\]](#).

Getting enough zinc may increase bone mineral density and help broken bones heal faster. However, supplements may only benefit people with low levels of zinc [\[R\]](#), [\[R\]](#), [\[R\]](#).

Please note: *A high intake of zinc may cause stomach pain and gut irritation. Adults should not ingest more than **40 mg** of zinc per day* [\[R\]](#), [\[R\]](#).

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Tea

IMPACT

2 / 5

EVIDENCE

3 / 5

How to implement

Drink 1-3 cups of tea daily, choosing from green, black, or herbal varieties according to preference. It's beneficial to consume tea throughout the day, either hot or cold, for ongoing hydration and health benefits.

Description

Tea is a beverage made by steeping the leaves of the *Camellia sinensis* plant in hot water. It comes in various types, including black, green, white, and herbal teas, and is known for its diverse flavors and potential health benefits due to polyphenols and other bioactive compounds.

[Green](#) and black tea are made from the same plant (*Camellia sinensis*). This plant is processed in different ways to make each type of tea [\[R, R\]](#).

Tea contains many active compounds. These include antioxidants like EGCG and amino acids like [L-theanine](#). Active components of tea help support [\[R, R, R, R, R, R\]](#):

- Heart health
- Cognition
- Immunity
- Relaxation

How it helps

Drinking tea may strengthen the bones and lower the odds of osteoporosis [\[R, R, R\]](#).

Green tea is full of polyphenols. These may help protect the bones from oxidative stress and inflammation [\[R, R\]](#).

However, drinking more tea may not lower the odds of fractures [\[R, R\]](#).

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Dietary Omega-3 Fatty Acids

IMPACT2 / 5

EVIDENCE2 / 5

How to implement

Incorporate foods high in omega-3 fatty acids into your diet daily. This includes eating fish such as salmon, mackerel, and sardines at least twice a week. Alternatively, include a tablespoon of flaxseed oil or chia seeds in your daily diet.

Description

[Omega-3 fatty acids](#) are some of the healthiest fats we can eat. They help lower inflammation and protect the heart, brain, and eyes. Our bodies produce less omega-3s than we need for optimal health, so it's important to get enough through food or supplements [\[R\]](#), [\[R\]](#), [\[R\]](#).

There are three major types of omega-3s: ALA, EPA, and DHA. **EPA and DHA are vital for mental and heart health** [\[R\]](#), [\[R\]](#), [\[R\]](#).

Fatty fish are rich in EPA and DHA. They include [\[R\]](#):

- Salmon
- Tuna
- Herring
- Sardines

For optimal health, try to get at least **two servings of fatty fish per week**. Fish oil supplements are available for those who don't eat fish regularly [\[R\]](#).

How it helps

Getting more omega-3s from food or supplements may improve bone health. It may decrease bone loss and the risk of hip fractures [\[R\]](#), [\[R\]](#), [\[R\]](#).

However, the evidence for omega-3 supplements is mixed. They may work better in combination with calcium [\[R\]](#).

Omega-3s may promote bone health by reducing inflammation [\[R\]](#).

Please note: *Fish oil can interact with blood thinners (like aspirin, Plavix, Coumadin). Consult your doctor before taking fish oil* [\[R\]](#).

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Magnesium

IMPACT2 / 5

EVIDENCE2 / 5

How to implement

Take up to 350 mg of magnesium daily as a supplement, preferably with a meal to enhance absorption.

TYPICAL STARTING DOSE

350 mg

Description

Magnesium is an essential mineral involved in various bodily functions, including muscle contractions, nerve signaling, and bone health. Maintaining adequate magnesium levels through diet or supplements can support overall well-being and reduce the risk of magnesium deficiency-related health issues.

[Magnesium](#) is an essential mineral. Your body needs it for [\[R\]](#), [\[R\]](#), [\[R\]](#):

- Muscle, nerve, and bone function
- Blood sugar and blood pressure control
- DNA and protein production
- Strong immunity

Women need **310-320 mg** of magnesium per day, while men need **400-420 mg** [\[R\]](#).

Foods rich in magnesium include **nuts, seeds, and leafy greens**. Magnesium is also available as a supplement [\[R\]](#).

How it helps

Low magnesium intake is linked to lower bone mineral density [\[R\]](#), [\[R\]](#).

Supplementing with magnesium (up to 350 mg/day for less than 4 weeks) may support bone health. It may help by reducing bone loss [\[R\]](#), [\[R\]](#), [\[R\]](#).