HEALTH BASICS

Vitamin D

Vitamin D is a nutrient that helps your body absorb calcium and maintain bones.

WHAT IT IS
A vitamin and hormone precursor supporting calcium balance and bones

WHERE IT COMES UP
Sunlight, foods, supplements, and blood test results

WHY IT MATTERS
Helps absorb calcium and maintain bones and muscles

WHAT IT IS NOT
Not a disease or diagnosis

WHO TO ASK
Primary care clinician, dietitian, pharmacist, or relevant specialist

HOW IT IS CHECKED
Blood 25-hydroxyvitamin D measurement

Overview

Vitamin D is a fat-soluble vitamin. This means your body can store it in body fat and the liver. It is also the starting material for a hormone that helps control calcium and phosphate levels.

You can get vitamin D when sunlight reaches your skin, from certain foods, and from supplements. Foods that may contain it include oily fish, egg yolks, liver, and fortified products. "Fortified" means vitamin D has been added during manufacturing. Depending on where you live, fortified products may include milk, plant-based drinks, cereals, or spreads.

There are two main forms used in foods and supplements:

Both forms can raise vitamin D levels. Product labels may list vitamin D in micrograms or international units, written as IU. One microgram equals 40 IU.

Vitamin D is not a disease or a diagnosis. A clinician may discuss it because of your diet, a supplement, a blood test, your bone health, or a condition that affects absorption.

- Vitamin D2, also called ergocalciferol
- Vitamin D3, also called cholecalciferol

How it works

Your skin can make vitamin D3 when it is exposed to ultraviolet B, or UVB, light from the sun. The amount made is affected by the season, time of day, latitude, cloud cover, clothing, sunscreen, age, and skin pigmentation. Because these factors differ, sunlight is not a precise way to measure a vitamin D dose.

Vitamin D from your skin, food, or supplements is not immediately active. Your liver first changes it into 25-hydroxyvitamin D, often shortened to 25(OH)D. This is the form usually measured in a blood test.

Your kidneys then convert some 25(OH)D into calcitriol, the active hormone. Calcitriol helps your intestines absorb calcium and phosphate from food. These minerals are needed to build and maintain bone. Vitamin D also contributes to normal muscle and nerve function.

The body regulates this process closely. The kidneys, parathyroid glands, intestines, and bones work together to keep the amount of calcium in the blood within a narrow range.

Why it matters for your health

Without enough vitamin D, your body absorbs less calcium. It may then draw calcium from bone to keep the blood calcium level steady.

Severe vitamin D deficiency can interfere with bone mineralisation. Mineralisation is the process that gives bone its hardness and strength. In children, this can cause rickets. In adults, it can cause osteomalacia, which means softened bones. Low vitamin D can also contribute to secondary hyperparathyroidism, in which the parathyroid glands become overactive because calcium balance is disturbed.

Your chance of having a low level may be higher if you have limited sun exposure, cover most of your skin, have darker skin, are an older adult, or eat few vitamin D-containing foods. Risk can also rise after some types of weight-loss surgery or with conditions that reduce fat absorption, such as coeliac disease, Crohn's disease, or pancreatic disease. Liver and kidney disorders can affect how vitamin D is processed.

These factors do not prove that your level is low. They help a clinician decide whether testing or tailored advice may be useful.

Vitamin D has been studied for many health outcomes beyond bones, including cancer, heart disease, infections, mood, and diabetes. Research has not shown that taking extra vitamin D routinely prevents all these conditions. More is not automatically better.

What can go wrong

Vitamin D deficiency means the body's vitamin D stores are low enough to raise concern about health effects. Laboratories and professional groups do not all use the same thresholds. A result should be interpreted alongside your age, health conditions, medicines, calcium level, and reason for testing.

Rickets affects growing bones in children. It can result from severe vitamin D deficiency, although other medical and nutritional causes are possible.

Osteomalacia is poor mineralisation of adult bone. Vitamin D deficiency is one possible cause. It is different from osteoporosis, in which bone becomes less dense and its internal structure weakens.

Vitamin D toxicity usually comes from taking excessive supplements, not from food or normal sun exposure. It can cause hypercalcaemia, meaning too much calcium in the blood. This may lead to vomiting, dehydration, confusion, abnormal heart rhythms, kidney stones, or kidney injury.

Arrange routine follow-up if you have a low test result, have been advised to take long-term supplements, or have a condition that affects vitamin D absorption or processing. Follow-up may include a review of your dose, diet, medicines, and blood results.

Seek prompt advice from a pharmacist, clinician, or poison service if you or a child may have taken a large amount of a vitamin D product. Seek emergency care for severe confusion, collapse, difficulty waking, or other signs of serious illness.

What you can do

For many healthy people, there is nothing special to monitor. Routine vitamin D blood testing is not supported for every adult without symptoms or a relevant health concern.

You can take practical steps when vitamin D comes up in your care:

Do not combine several vitamin D products without adding up the total amount. High-dose products may look similar to ordinary daily supplements, so read the unit and instructions carefully.

Your needs may require individual advice if you are pregnant, caring for an infant, receiving osteoporosis treatment, living in residential care, or managing a condition that affects absorption. Recommendations also differ between countries because diets, food fortification, and sunlight exposure differ.

Sunlight can help the body make vitamin D, but ultraviolet light also damages skin and increases skin cancer risk. Do not use deliberate sunburn or tanning beds as a vitamin D strategy. Follow local sun-safety advice and discuss food or supplements if sun exposure is limited.

- Check food and supplement labels for vitamin D and serving size
- Record the product, dose, and frequency of every supplement you take
- Ask why a blood test is being suggested and how the result would change care
- Ask which target or reference range is being used to interpret your result
- Tell your clinician about kidney, liver, bowel, or parathyroid conditions
- Ask a pharmacist to check for overlap between multivitamins and separate products

Common questions

Should everyone have a vitamin D blood test?

No. Testing is most useful when there is a specific reason, such as suspected bone disease, an abnormal calcium result, malabsorption, certain kidney or liver conditions, or planned treatment that requires assessment. Major US guidance does not support routine population screening when there is no clinical indication.

Which blood test measures vitamin D?

The usual test is serum 25-hydroxyvitamin D, written as 25(OH)D. Testing calcitriol, or 1,25-dihydroxyvitamin D, does not usually show the body's vitamin D stores. It is reserved for particular medical questions.

Is vitamin D3 better than vitamin D2?

Both can treat low vitamin D levels. Vitamin D3 may raise and maintain the measured level more effectively in some circumstances, but the correct product and schedule depend on why it is being used. Check that the product matches the instructions you were given.

Can I get all the vitamin D I need from food?

Some people can, especially where commonly eaten foods are fortified. Others may have difficulty because relatively few foods naturally contain much vitamin D. A dietitian can help assess your usual intake without relying on guesswork.

Will vitamin D improve tiredness or low mood?

Tiredness and low mood have many possible causes. A vitamin D result alone may not explain them, and supplements are not a substitute for a broader assessment. If these concerns

persist, arrange routine clinical follow-up.

Can sunlight cause vitamin D toxicity?

The body limits vitamin D production in the skin, so toxicity does not result from ordinary sunlight exposure. However, sunlight can still damage the skin. Vitamin D toxicity is usually linked to excessive supplement use.

Sources

- National Institutes of Health Office of Dietary Supplements. Vitamin D: Fact Sheet for Health Professionals .
- National Academies of Sciences, Engineering, and Medicine. Dietary Reference Intakes for Calcium and Vitamin D . National Academies Press; 2011.
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