

Today is the fourth in a series discussing calcium why it is important and what is needed to absorb and regulate it in the body.

Today we will discuss Vitamin D. Most of this information comes from the National Institute of Health, Office of Dietary Supplements.

...What is Vitamin D?

...How is Vitamin D absorbed and what forms are there?

...Why is Vitamin D so important?

...What are good sources of Vitamin D?

...How is Vitamin D measured?

...Why supplement Vitamin D?

What is Vitamin D?

Vitamin D (also referred to as "calciferol") is a fat-soluble vitamin that is naturally present in a few foods, added to others, and available as a dietary supplement. It is also produced endogenously when ultraviolet (UV) rays from sunlight strike the skin and trigger vitamin D synthesis.

How is Vitamin D absorbed and what forms are there?

Vitamin D obtained from sun exposure, foods, and supplements is biologically inert and must undergo two hydroxylations in the body for activation.

The first hydroxylation, which occurs in the liver, converts vitamin D to 25-hydroxyvitamin D [25(OH)D], also known as "calcidiol."

The second hydroxylation occurs primarily in the kidney and forms the physiologically active 1,25-dihydroxyvitamin D [1,25(OH)2D], also known as "calcitriol".

In foods and dietary supplements, vitamin D has two main forms, D2 (ergocalciferol) and D3 (cholecalciferol), that differ chemically only in their side-chain structures.

Both forms are well absorbed in the small intestine. Absorption occurs by simple passive diffusion and by a mechanism that involves intestinal membrane carrier proteins. The concurrent presence of fat in the gut enhances vitamin D absorption, but some vitamin D is absorbed even without dietary fat. Neither aging nor obesity alters vitamin D absorption from the gut.

Why is Vitamin D so important?

Vitamin D promotes calcium absorption in the gut and maintains adequate serum calcium and phosphate concentrations to enable normal bone mineralization and to prevent hypocalcemic tetany (involuntary contraction of muscles, leading to cramps and spasms). It is also needed for bone growth and bone remodeling by osteoblasts and osteoclasts.

Without sufficient vitamin D, bones can become thin, brittle, or misshapen. Vitamin D sufficiency prevents rickets in children and osteomalacia in adults.

Together with calcium, vitamin D also helps protect older adults from osteoporosis.

Vitamin D has other roles in the body, including reduction of inflammation as well as modulation of such processes as cell growth, neuromuscular and immune function, and glucose metabolism.

Many genes encoding proteins that regulate cell proliferation, differentiation, and apoptosis (process of programmed cell death. It is used during early development to eliminate unwanted cells; for example, those between the fingers of a developing hand) are modulated in part by vitamin D.

Many tissues have vitamin D receptors, and some convert 25(OH)D to 1,25(OH)2D.

What foods have Vitamin D?

Vitamin D Content of Selected Foods

Food\* (mcg) /serving (IU)/serving %DV\*

Cod liver oil 1 tablespoon 34.0 1,360 170

Trout (rainbow), 3 ounces 16.2 645 81

Salmon, cooked, 3 ounces 14.2 570 71

Mushrooms, ½ cup (UVexp) 9.2 366 46

Milk, 2%, vit D, 1 cup 2.9 120 15

Soy, almond, oat milks, vit D 100-144 13-18

Ready-to-eat cereal, fortified with 10% of the DV for vitamin D, 1 serving 2.0 80 10

Sardines (Atlantic), canned in oil, drained, 2 sardines

1.2 46 6

Egg, 1 large, scrambled\*\* 1.1 44 6

Liver, beef, braised, 3 oz 1.0 42 5

Tuna fish (light), canned in water, drained, 3 ounces

1.0 40 5

Cheese, cheddar, 1 ounce 0.3 12 2

Mushrooms portabella, ½ c 0.1 4 1

Chicken breast, roasted, 3 oz 0.1 4 1

Beef, ground, 90% lean, 3 oz 0 1.7 0

\* DV = Daily Value. The FDA developed DVs to help consumers compare the nutrient contents of foods and dietary supplements within the context of a total diet. The DV for vitamin D on the new Nutrition Facts and Supplement Facts labels and used for the values in Table 3 is 20 mcg (800 IU) for adults and children aged 4 years and older. The new labels must list vitamin D content in mcg per serving and have the option of also listing the amount in IUs in parentheses. FDA required manufacturers to use these new labels starting in January 2020, but companies with