

# Vitamin D, the Sunlight Vitamin

Together, vitamin D and calcium promote strong bones. Severe vitamin D deficiency causes rickets, which is a disease that results in soft, easily fractured bones that are often deformed. Recent research suggests that vitamin D also plays a part in preventing childhood diabetes. In adults, there is new evidence that vitamin D plays a role in maintaining a healthy immune system and helps in the prevention of diseases like multiple sclerosis, rheumatoid arthritis, cancers, diabetes, high cholesterol and infections.

Over the years, cases of rickets have been reported in all ages, notably in breast fed infants who have dark skin and receive very little sun exposure. These reports prompted more research into vitamin D deficiency, and thus the American Academy of Pediatrics recently revised the recommendations for Vitamin D supplementation. This handout will explain how children of all ages can achieve optimal vitamin D intake in the form of food and vitamins. Sunshine is the natural source of vitamin D, but most of us do not get enough exposure to the sun to get adequate vitamin D.

## Who needs to take vitamin D supplements?

### Give 400 IU per day of vitamin D supplement:

(IU = international units)

- to all breastfed infants (including those who also drink some formula) starting in the first few days of life.
  - Consider stopping the supplement if the infant starts taking at least 32oz/day of vitamin D-fortified formula (under 1 year old) or cow's milk.
  - to all non-breastfed infants, children, teens and adults if they get less than 32oz/day of vitamin D-fortified milk (or infant formula if less than 12 months old).
    - Less vitamin supplement can be given if other dietary sources of vitamin D, such as fortified foods, are eaten daily. (see food chart on reverse side)
  - to people with increased risk of vitamin D deficiency
    - chronic fat malabsorption (cystic fibrosis)
    - taking anti-seizure medications (some drugs increase the metabolism of vitamin D.)



## Vitamin D Preparations

There are many tablets available, both chewable and not, that contain 400IU of vitamin D per tablet. Your child should take one that is appropriate for their age and provides this amount of vitamin D. As an infant, liquids are obviously more appropriate, and typically contain 400IU vitamin D per 1 milliliter.

Some common vitamin preparations	Fluoride per ml	Fluoride per tab
Tri-Vi-Sol (vit A,D,C)	////////	Does not come as a tablet.
Tri-Vi-Sol w Iron (vit A,D,C + iron)	////////	
Tri-Vi-Flor (vit A,D,C + fluoride)	0.25	
Tri-Vi-Flor w Iron (vit A,D,C + iron + fluoride)	0.25	
Poly-Vi-Sol (multiple vitamins)	////////	
Poly-Vi-Sol w Iron (multiple vitamins + iron)	////////	
Poly-Vi-Flor (multiple vitamins + fluoride)	0.25,0.5	0.25,0.5,1
Poly-Vi-Flor w Iron (multiple vitamins + fluoride + iron)	0.25	0.25, 0.5
Luride (fluoride only)	0.5	0.25,0.5,1

Fluoride supplementation is recommended for breast fed infants after 6 months of age. Fluoride can be discontinued if your baby gets fluoridated water mixed in formula or juices. Fluoride requires a prescription from your doctor. Your doctor will help you determine if your child needs a single ingredient vitamin D or a multiple vitamin preparation, with or without iron.

The amount of vitamin D in breast milk depends on the mother's vitamin D status, which is likely less than optimal, just like the rest of the population. Breast milk does provide all of the other vitamins most babies need, and most children who eat a well rounded diet don't really need a multivitamin. But until single ingredient vitamin D supplements are manufactured, multi-vitamins are the only choice.

# Food Sources of Vitamin D

Office of Dietary Supplements  
National Institutes of Health, 12/08

Food	IUs/serving <sup>1</sup>
Cod liver oil, 1 tablespoon	1,360
Salmon, cooked, 3.5 ounces	360
Mackerel, cooked, 3.5 ounces	345
Tuna fish, canned in oil, 3 ounces	200
Sardines, 1.75 ounces Canned in oil, drained	250
Milk, vitamin D-fortified, 1 cup Includes nonfat, reduced fat, and whole	98
Margarine, fortified, 1 tablespoon	60
Ready-to-eat cereal, 0.75-1 cup Fortified with 10% of the DV <sup>2</sup> for vit D	40
Egg, 1 whole (vitamin D is found in yolk)	20
Liver, beef, cooked, 3.5 ounces	15
Cheese, Swiss, 1 ounce	12

1. IUs = International Units      2. DV = Daily Value

## Vitamin D in Foods

Very few foods in nature contain vitamin D.

- The flesh of fish (salmon, tuna, mackerel) and fish liver oils are among the best sources.
- Small amounts of vitamin D are found in beef liver, cheese, and egg yolks.

Vitamin D Fortification in foods:

- In the 1930s, a **milk fortification program** was implemented in the U.S. to combat rickets. This program virtually eliminated the disorder at that time.
- Today, fortified foods provide most of the vitamin D in the American diet, as almost all of the U.S. milk supply is fortified with 100 IU vitamin D per 8 oz.
- Other dairy products made from milk, such as cheese and ice cream, are rarely fortified.
- Ready-to-eat breakfast cereals often contain added vitamin D, as do some brands of orange juice, yogurt, and margarine.
- In the U.S., maximum levels of added vitamin D are specified by law and only certain foods are allowed to be fortified.

## How much sun exposure is necessary to get enough vitamin D?

The amount of sun exposure available for a person's synthesis of vitamin D depends on the amount of pigment in their skin, their body mass, distance from the equator, season of the year, amount of cloud cover, amount of air pollution, amount of skin exposed, and the extent of sunscreen use.

In adults with light skin, full-body exposure during the summer for 10-15 minutes will result in approximately 10-20,000 IU of vitamin D within 24 hours. People with dark skin need 5-10 times more exposure to get similar amounts. Studies have shown, however, that the average adult American spends 93% of their time indoors. It is apparent that modern school aged children and adolescents also spend more time indoors than ever before.

Furthermore, it is difficult to determine what sun exposure is adequate for infants and children due to the many factors that affect vitamin D synthesis by the skin, the most important of which is skin pigmentation. And notably, it is still recommended by most pediatricians and dermatologists to minimize sunlight exposure because of the risk of skin cancer. Thus, vitamin D supplementation is necessary.

According to Dr. Michael Holick, as little as 5-10 minutes of sun exposure on arms and legs or face and arms 3 times weekly between 11:00 am and 2:00 pm during the spring, summer, and fall at 42 degrees latitude (which is the location of Lincoln, Nebraska) should provide a light-skinned individual with adequate vitamin D and allow for storage of any excess for use during the winter with minimal risk of skin damage.

Holick MF. Vitamin D deficiency: what a pain it is. *Mayo Clin Proc.* 2003;78(12):1457-1459