



# Vitamin D Supplementation for Breastfed Infants

## 2004 Health Canada Recommendation

This statement updates the recommendation for vitamin D supplementation made in the 1998 document *Nutrition for Healthy Term Infants*, page 18 [1]. A set of questions and answers for professionals has been developed to accompany this document and is available at the following address:

[www.healthcanada.ca/nutrition](http://www.healthcanada.ca/nutrition)

### Recommendation:

**It is recommended that all breastfed, healthy term infants in Canada receive a daily vitamin D supplement of 10 µg (400 IU).**

**Supplementation should begin at birth and continue until the infant's diet includes at least 10 µg (400 IU) per day of vitamin D from other dietary sources or until the breastfed infant reaches one year of age.**

### Background

Health Canada promotes breastfeeding as the best method of feeding infants as it provides optimal nutritional, immunological and emotional benefits for the growth and development of infants [2]. However, a daily vitamin D supplement has been recommended for breastfed infants in Canada since 1927 [3]. The recommended level has been set at 10 µg (400 IU) per day since 1967 [4]. A review of the recommendation was prompted by the publication of the 1997 Dietary Reference Intakes (DRI) for vitamin D, in which an adequate intake of at least 5 µg (200 IU) is recommended for infants 0-1 year of age [5].

### Summary of Rationale

After careful consideration of the evidence presented in the DRI report, along with a review of recent evidence as it applies to factors related to living in Canada, Health Canada decided to continue with a recommendation of 10 µg (400 IU) per day. A daily 10 µg (400 IU) vitamin D supplement is recommended for all breastfed full-term infants in Canada given the following considerations: sunlight is the main source of vitamin D for humans, Canada's northern geographic latitude, current practices related to protection from the sun, prevalence of vitamin D deficiency rickets and history of safe use of vitamin D supplementation. Also, while the importance of vitamin D in infancy has been focused on protection from rickets, emerging research suggests that optimal vitamin D status may play a role in the protection against the development of other diseases [6]. A population health approach to vitamin D supplementation is warranted because it is not practical, nor cost-effective to screen all mothers and infants for vitamin D deficiency. Administration of a daily vitamin D supplement of 10 µg (400 IU) or ensuring adequate dietary intake of vitamin D can prevent vitamin D deficiency, without risk of toxicity.

**The following is a summary of the information reviewed to inform this recommendation.**



## 1) Sunlight is the main source of vitamin D for humans

Worldwide, sunlight is the principal source of vitamin D for all humans, including infants. Vitamin D is synthesized in the skin after exposure to ultraviolet B radiation. Latitude, time of day, season of the year, increased use of sunscreen, amount of skin exposed, pigmentation of the skin and air pollution have a dramatic effect on the quantity of vitamin D produced in the skin. The geographic latitude of Canada (from 43°N in Toronto to higher than 60°N in the Northwest Territories, Nunavut and the Yukon Territory) means inadequate ultraviolet exposure to stimulate formation of vitamin D in the skin for a large portion of the year. For example, at 52° N in Edmonton, no synthesis of vitamin D occurs in the skin between October and March [7].

## 2) Direct sun exposure is not recommended for infants and young children

Although sunlight is the main source of vitamin D, both the Canadian Dermatology Association and Health Canada advise that infants under one year should be kept out of direct sunlight due to the risk of skin cancer [8]. For infants over six months who are exposed to sunlight, the use of sunscreen is recommended. The use of sunscreen with a sun protection factor of eight reduces the cutaneous production of vitamin D by 97.5% in adults [9]. Dietary vitamin D is therefore recommended to correct for a lack of exposure to ultraviolet light.

## 3) Infants in Canada may be at risk of vitamin D deficiency

Canadian studies [10,11] and the ongoing surveillance of childhood illnesses by the Canadian Paediatric Society [12], provide evidence that vitamin D deficiency rickets has not been eradicated in Canada. Vitamin D deficiency can result in rickets, a painful disease characterized by a softening of the bones and the growth plates. The precise rate of vitamin D deficiency rickets in Canada is unknown. In 2002, the Canadian Paediatric Society launched a surveillance program to study the incidence of vitamin D deficiency rickets among children living in Canada [12]. In the first 18 months of the study, 69 cases of vitamin D deficiency rickets were confirmed among infants and toddlers in Canada, and another 11 were under review. It was reported that 85% of all cases had been breastfed and 86% of all cases had not received vitamin D supplementation prior to the development of the disease. While the Canadian Paediatric Surveillance Program captures rickets reporting by a large number of paediatricians coast to coast (2,300), not all physicians who treat

children with rickets participate in the program. As such, it is recognized that the total number of rickets cases reported in this study is likely an underestimate of the actual number of cases among children living in Canada. This is especially true for identification of rickets in the North, as many of the children with rickets in Northern communities will be diagnosed and treated by family physicians and nurse practitioners rather than by paediatricians.

Dark-skinned infants are particularly at risk for developing rickets because they require increased exposure to sunlight to produce the same amount of vitamin D compared to light-skinned infants. In adults, highly pigmented skin will require 10 to 20 fold longer exposure to sunlight to make the same amount of vitamin D<sub>3</sub> as white-skinned adults [7]. A further risk factor for vitamin D deficiency in early life is maternal sub-clinical vitamin D deficiency. When mothers have adequate vitamin D stores, trans-placental vitamin D provides for foetal stores that may be adequate for about the first 2 months of life [13]. However, concern has been raised that women in the periconceptual age group may be entering pregnancy and lactation with low vitamin D status [14]. This is likely due to a combination of factors, including avoidance of milk, lack of vitamin D supplementation, as well as limited exposure to sun. If a mother has sub-clinical vitamin D deficiency, then the infant will be born with limited stores of vitamin D.

## 4) Emerging research on vitamin D and other diseases

Recent studies suggest that optimal vitamin D status may be important as protection against the development of other diseases [6, 15, 16, 17]. While the importance of vitamin D in infancy has been targeted to protection from rickets, there may be other functions for vitamin D during early development that have not yet been elucidated.



## 5) There are very few dietary sources of vitamin D

In nature, very few foods contain vitamin D. Fatty fish, fish oils and egg yolks are some of the main sources (See table in Implications for Practice section).

After vitamin D was recognized as being critically important for the prevention of rickets, Canada (and many other countries) instituted a policy of fortifying some foods with vitamin D. Almost all human dietary intake of vitamin D comes from fortified foods (in Canada, all cow's milk and margarine are fortified with vitamin D).

Breastfed infants who are not exposed to sunlight are unlikely to obtain adequate amounts of vitamin D from breast milk to satisfy their needs beyond early infancy [5] because the vitamin D content of human milk is low (1-10 IU/250 mL) [18]. The vitamin D available to the infant during the first 6 months of life depends initially on the vitamin D status of the mother during pregnancy and later on the infant's diet and exposure to sunlight [5].

Recent studies have investigated the efficacy of supplementing breastfeeding mothers with high doses of vitamin D to prevent rickets in their infants [19]. Further studies on the safety and efficacy of high dose vitamin D in pregnancy and lactation are needed before such information can be translated into practice recommendations.

## 6) The Dietary Reference Intakes (DRI)\* report [5] recommends an Adequate Intake (AI)\*\* of at least 5 µg (200 IU) per day of vitamin D for children aged 0-1 year

The Adequate Intake (AI)\*\* for infants aged 0 through 12 months is based on the lowest dietary intake of vitamin D that has been associated with a mean plasma 25 (OH) vitamin D concentration greater than 11ng/mL (the lower limit of normal). Plasma 25 (OH) vitamin D concentrations less than 11 ng/mL are observed in infants with vitamin D-deficiency rickets. For infants 0-6 months of age, an AI of at least 5 µg (200 IU) per day is recommended to maintain serum 25 (OH) vitamin D concentration above the range often observed in cases of rickets. For infants aged 7-12 months, the AI is also set at 5 µg (200 IU) per day based on the observation that, "in the absence of sun-mediated vitamin D synthesis, approximately 5 µg (200 IU) per day of vitamin D maintained serum levels in the normal range, but below circulating concentrations attained by infants in the

summer". The DRI also states that "an intake of 10 µg (400 IU) per day would not be excessive" for infants 0-12 months. This AI assumes no vitamin D production from sunlight exposure.

### Tolerable Upper Intake Level\*\*\*

The Tolerable Upper Intake Level (UL) for vitamin D for infants up to one year of age is set at 25 µg (1000 IU) per day which is based on studies examining the highest intake at which no adverse effects were observed on linear growth.

*\* The Dietary Reference Intakes (DRIs) are a set of nutrient reference values that have been established for the healthy North American population. There are several different types of reference values, depending on the type of evidence that was used to establish the value.*

*\*\* An Adequate Intake (AI) is a recommended average daily nutrient intake level based on experimental data or determined by estimating the amount of a nutrient eaten by a group of healthy people. An AI is set when there is not sufficient scientific evidence available to determine an Estimated Average Requirement and calculate a Recommended Dietary Allowance.*

*\*\*\* The Tolerable Upper Intake Level (UL) is the highest continuing daily intake of a nutrient that is likely to pose no risks of adverse health effects for almost all individuals.*

## Implications for Practice

The available evidence supports this recommendation of a daily 10 µg (400 IU) vitamin D supplement for all breastfed full-term infants in Canada. Health Canada encourages all health professionals to promote and implement this recommendation at the national, provincial and community level.





Supplementation should begin at birth and be discontinued when the infant's diet provides 10 µg (400 IU) per day of vitamin D from other dietary sources or when the breastfed infant reaches one year of age.

**The table below provides a list of the most common Canadian dietary sources of vitamin D.**

### Most Common Canadian Dietary Sources of Vitamin D

Food	International Units of Vitamin D*
Egg yolk, one	25 IU
** All cow's milk (fortified), 250 mL	88 IU
Infant formula (fortified), 250 mL	100 IU
Margarine (fortified), 1 tsp	25 IU
Salmon, cooked, 1 oz	103 IU
***Fortified plant based beverage, 250 mL	80 IU

\* 1 µg = 40 IU of vitamin D

\*\* Cow's milk is not recommended before 9 to 12 months of age [1].

\*\*\* Vegetarian beverages are inappropriate alternatives to breast milk, infant formula or cow's milk in the first two years of life [1].

- Single vitamin D<sub>3</sub> supplement drops are recommended and available without a prescription in pharmacies and some grocery stores.

- Breastfeeding mothers should maintain a healthy, well-balanced diet according to *Canada's Food Guide to Healthy Eating* even when a vitamin D supplement is provided to the infant.

### Implications for Research

- Further research studies are necessary to determine optimal vitamin D intakes for pregnant and lactating women as a function of latitude and race.

- There is also a need for surveillance of current practices related to vitamin D supplementation correlated with vitamin D levels in infants.

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The feedback and advice of the Expert Advisory Committee on Dietary Reference Intakes has been incorporated into the present statement. This document has also been reviewed by:

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