

# Vitamin D in Toddlers

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## Key Messages

- Young children are at risk of low vitamin D intakes and status
- National surveys, prospective cohorts, and dietary intervention studies have shown that fortification of foods consumed by toddlers is a safe and effective approach to increasing their vitamin D intakes and status
- Dose-response trials in 1 to 3-year-olds are still needed to estimate the actual vitamin D requirement among toddlers

## Background

Young children and toddlers (1–3 years) are at risk of nutrient deficiencies due to their limited appetite relative to their high requirements for growth and development. Vitamin D has been identified as a risk nutrient for toddlers in many countries. Vitamin D is a fat-soluble vitamin that is obtained from a combination of skin synthesis during sunshine exposure and from the diet. As it has a key role in the regulation of calcium and phosphorus metabolism, vitamin D is critical for healthy bone growth and development in childhood. Prevention of very low vitamin D status is also important for robust immune function.

## Vitamin D in the Diets of Young Children

Due to the extended winter period, people resident at high latitudes need to obtain sufficient vitamin D from the diet for prevention of vitamin D deficiency. Foods containing substantial amounts of naturally occurring vitamin D are limited and not consumed on a regular basis by young children. Small but important amounts of vitamin D<sub>3</sub> are found in commonly consumed staple foods, such as meat, dairy, and eggs. Vitamin D<sub>2</sub> (ergocalciferol)

can be obtained from irradiated mushrooms. Depending on regional legislation, some foods are fortified with vitamin D, including milk, infant formula, yogurt, spread, cheese, juice, bread, and breakfast cereals. In addition, vitamin D is available as a dietary supplement, either as vitamin D<sub>2</sub> or vitamin D<sub>3</sub>.

## Recommended Intakes of Vitamin D in Toddlers

Current recommendations for individual intakes of vitamin D in Europe and North America vary between countries, from 10 to 20 µg/day (400 to 800 IU), shown in Table 1. Based on adult recommendations, these are the intakes of vitamin D that will achieve circulating 25-hydroxyvitamin D (25(OH)D) concentrations (the biomarker of vitamin D status) of 25–50 nmol/L, for the prevention of adverse bone health outcomes.

## Intakes of Vitamin D among Toddlers Relative to Recommendations

Vitamin D intakes among young children are generally between 2 and 9 µg/day, including countries with mandatory or voluntary vitamin D fortification [1]. While nutritional supplements can

Table 1. Summary of current individual vitamin D recommendations in toddlers

Agency	Region	Individual intake, µg/day	25(OH)D target, nmol/L
European Food Safety Authority, 2016 <sup>1</sup>	EU	15	50
Scientific Advisory Committee on Nutrition, 2016 <sup>2</sup>	UK	10	25
NORDEN, 2012 <sup>3</sup>	Nordic countries	10	50
German Nutrition Society, 2012 <sup>4</sup>	DACH countries	20	50
Institutes of Medicine, 2011 <sup>5</sup>	US/Canada	15	50

<sup>1</sup>EFSA Panel on Dietetic Products, Nutrition and Allergies. Dietary Reference Values for Vitamin D (scientific opinion). EFSA Journal 2016 Oct; 179 pp. DOI: 10.2903/j.efsa.2016.

<sup>2</sup>Scientific Advisory Committee on Nutrition. Report on Vitamin D and Health. 2016. Published online at: <http://www.sacn.gov.uk/pdf> (accessed: July 1, 2016).

<sup>3</sup>Norden. Nordic Nutrition Recommendations. Copenhagen: Norden; 2012.

<sup>4</sup>German Nutrition Society. New Reference Values for Vitamin D. Ann Nutr Metab 2012;60:241–6.

<sup>5</sup>Institute of Medicine. Dietary Reference Intakes for Calcium and Vitamin D. Washington: The National Academies Press; 2011.

be important contributors to vitamin D intake, current rates of supplement use among toddlers are often low [2, 3]. Key food sources of vitamin D in toddlers are vitamin D-fortified milks, formula, breakfast cereals and yogurts, meat, and eggs [4]. Even in countries where voluntary fortification with

vitamin D is widespread, almost all children have intakes of vitamin D below 10 µg/day [3].

## Is There Evidence for Low Vitamin D Status among Toddlers?

Evidence for extensive low vitamin D status is mixed, and it seems that aver-

age 25(OH)D concentrations among children decrease with increasing age, possibly due to reducing milk intake. In the UK National Diet and Nutrition Survey among 1.5- to 3-year-olds, the prevalence of year-round plasma 25(OH)D concentrations <25 nmol/L was 8% [5]. In a study of 741 toddlers