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## Food and Nutrition

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### Vitamin D and Calcium: Updated Dietary Reference Intakes

The U.S. Institute of Medicine (IOM) released its report on the review of the Dietary Reference Intakes (DRIs) for vitamin D and calcium on November 30, 2010. The review was jointly commissioned and funded by the U.S. and Canadian governments.

The decision to commission the IOM review reflects the government's goal of ensuring that Canadians benefit from the most up to date health and nutritional advice.

The recommended amount of vitamin D per day has increased for everyone. But this does not mean that Canadians need to change their current food or supplement intakes. Based on Health Canada's preliminary analysis of Canadians' vitamin D blood levels, most are currently meeting their needs for vitamin D.

The IOM report states that there is no additional health benefit associated with vitamin D intakes above the level of the new Recommended Dietary Allowance (RDA). Health Canada reminds Canadians that total vitamin D intake should remain below the level of the new Tolerable Upper Intake Level (UL) to avoid possible adverse effects.

### What is Vitamin D?

Vitamin D is a nutrient that helps the body use calcium and phosphorous to build and maintain strong bones and teeth. Too little vitamin D can cause calcium and phosphorus levels in the blood to decrease, leading to calcium being pulled out of the bones to help maintain stable blood levels. This can cause rickets in children and osteomalacia (softening of the bones) or osteoporosis (fragile bones) in adults. However, too much vitamin D can cause too much calcium to be deposited in the body, which can lead to calcification of the kidney and other soft tissues including the heart, lungs and blood vessels.

### What Are DRIs?

Dietary Reference Intakes (DRIs) are recommendations for nutrient intakes. They are a comprehensive set of nutrient reference values for healthy populations established by Canadian and American scientists through a review process overseen by the Institute of Medicine (IOM) of the National Academies, which is an independent, nongovernmental body in the United States. Dietary Reference Intakes or DRIs is an umbrella term that describes four types of reference values: Estimated Average Requirement (EAR), Recommended Dietary Allowance (RDA), Adequate Intake (AI) and Tolerable Upper Intake Level (UL).

### Why review the DRIs?

Health Canada and the Public Health Agency of Canada (PHAC), along with several U.S. government agencies, co-sponsored a review of the 1997 Dietary Reference Intakes (DRIs) for vitamin D and calcium. The review was commissioned because of the availability of sufficient new and relevant scientific research to warrant a re-evaluation of the existing values.

### New DRIs for Vitamin D

The IOM expert committee reviewed a number of health outcomes that could potentially be related to calcium and vitamin D, such as cancer, cardiovascular disease, diabetes, and immunity, and found that the evidence was inconsistent and did not demonstrate a cause-and-effect relationship. Consequently, these health outcomes could not be used for the purposes of determining nutrient requirements.

At this time, the scientific data available indicate a key role for calcium and vitamin D in skeletal health and provide a sound basis for recommended intakes.

The DRIs for vitamin D have been set assuming minimal sun exposure for all.

The DRIs for vitamin D, that can also be found in the DRI tables, are as follows:

Age group	Recommended Dietary Allowance (RDA) per day	Tolerable Upper Intake Level (UL) per day
Infants 0-6 months	400 IU (10 mcg) *	1000 IU (25 mcg)
Infants 7-12 months	400 IU (10 mcg) *	1500 IU (38 mcg)
Children 1-3 years	600 IU (15 mcg)	2500 IU (63 mcg)
Children 4-8 years	600 IU (15 mcg)	3000 IU (75 mcg)
Children and Adults 9-70 years	600 IU (15 mcg)	4000 IU (100 mcg)
Adults > 70 years	800 IU (20 mcg)	4000 IU (100 mcg)
Pregnancy & Lactation	600 IU (15 mcg)	4000 IU (100 mcg)

\*Adequate Intake rather than Recommended Dietary Allowance.

The IOM report states that there are no additional health benefits associated with vitamin D intakes above the level of the new RDA.

Total vitamin D intake should remain below the level of the new UL to avoid possible adverse effects.

### New DRIs for Calcium

Calcium is the most abundant mineral in the body. Over 99% of the body's calcium supply is found in the bones and teeth where it supports their structure. Calcium is also important for proper muscle function, nerve transmission, and hormonal secretion.

The DRIs for calcium are based on evidence related to bone health, largely from the results of calcium balance studies. Calcium balance, which can be positive, neutral or negative, compares total calcium intake with urinary and fecal excretion of calcium. It is used to determine the accumulation and level of bone mass.

The DRIs for calcium, that can also be found in the DRI tables, are as follows (note these values are for Vitamin D and Calcium):

Age group	Recommended Dietary Allowance (RDA) per day	Tolerable Upper Intake Level (UL) per day
Infants 0-6 months	200 mg *	1000 mg
Infants 7-12 months	260 mg *	1500 mg
Children 1-3 years	700 mg	2500 mg
Children 4-8 years	1000 mg	2500 mg
Children 9-18 years	1300 mg	3000 mg
Adults 19-50 years	1000 mg	2500 mg
Adults 51-70 years		
Men	1000 mg	2000 mg
Women	1200 mg	2000 mg
Adults > 70 years	1200 mg	2000 mg
Pregnancy & Lactation		
14-18 years	1300 mg	3000 mg
19-50 years	1000 mg	2500 mg

\*Adequate Intake rather than Recommended Dietary Allowance.

The IOM report states that there are no additional health benefits associated with calcium intakes above the level of the new RDA.

Total calcium intake should remain below the level of the new UL to avoid possible adverse effects.

## **What are Health Canada's Existing Recommendations?**

### **All Canadians**

Currently, the advice contained in *Eating Well with Canada's Food Guide* recommends that all Canadians over the age of two, including pregnant and lactating women, consume 500mL (two cups) of milk or fortified soy beverages every day. These foods are fortified with vitamin D.

### **Adults over the age of fifty**

Health Canada recommends that, in addition to following *Canada's Food Guide*, everyone over the age of 50 should take a daily vitamin D supplement of 400 IU.

### **Infants**

Health Canada recommends that all breastfed, healthy term babies receive a daily vitamin D supplement of 400 IU. Supplementation of the vitamin should begin at birth and continue until one year of age. This recommendation is to help reduce the risk of rickets, a disease that affects bone growth in children. Infants who are formula fed receive adequate vitamin D from formula.

## **What is Health Canada Doing Now? Will Existing Recommendations Change?**

Health Canada uses the DRIs in a variety of policies and programs that benefit the health and safety of Canadians. The DRIs influence the development of regulatory standards, assessment of dietary intakes, and the development of dietary guidance for the general population and for specific life stages.

The review of the new DRIs to assess the impact they may have on dietary guidance for Canadians will begin immediately. We will keep Canadians informed as the work progresses.

A thorough analysis of the impact of recommended values is needed. As well as examining the dietary intakes of Canadians, current Canadian blood level data available from the Canadian Health Measures Survey (CHMS) will be used to help determine the extent to which changes to guidance may be required.

Health Canada also plans to make use of an expert advisory committee, that can consider specific, complex implementation questions related to vitamin D and calcium and provide advice to Health Canada within a relatively quick timeframe.

## **Background on the Review of the DRIs for Vitamin D and Calcium**

There has been a significant amount of information published on vitamin D requirements since the DRIs for vitamin D and calcium were first published in 1997. In addition to the studies on the role of vitamin D in calcium metabolism and skeletal and muscular health, there have been studies on the association of vitamin D with cancers, autoimmune diseases and cardiovascular disease.

Because of the availability of sufficient new and relevant scientific research, Health Canada, the Public Health Agency of Canada, and several U.S. government agencies co-sponsored a review of the 1997 Dietary Reference Intakes (DRIs) for vitamin D and calcium.

The Food and Nutrition Board of the IOM put together a committee of scientific experts for this review of vitamin D and calcium in January 2009. As in previous DRI reviews conducted by the Food and Nutrition Board of the IOM, the expert panel reviewing the latest science related to vitamin D was made up of experts from both Canada and the U.S.

To inform and support the IOM's Expert Panel review of vitamin D and calcium, the U.S. Agency for Healthcare Research and Quality (AHRQ) was tasked to undertake a comprehensive and systematic review of the scientific literature on the relationships of vitamin D and calcium intakes to nutrient status indicators and health outcomes. This systematic, evidence-based review, jointly funded by the American and Canadian governments, was released in the summer of 2009. The AHRQ review found that despite the relatively large number of studies included, it was difficult to make any substantive statements on the effects of either vitamin D or calcium nutrient status on cancer, development of hypertension, heart disease, immunologic disorders, and pregnancy-related outcomes including preeclampsia.

Canadian data from the Canadian Community Health Survey Cycle 2.2, Nutrition, and the Canadian Health Measures Survey were used in the IOM review.

Cycle 2.2 of the Canadian Community Health Survey (CCHS) was developed to provide focused Vitamin D and Calcium: Updated Dietary Reference Intakes - Nutrition and Healthy Eating - Health Canada information related to the topic of nutrition. It provides the first national nutrition data since the Nutrition Canada survey was conducted in nearly 40 years. The data provide reliable information about the food and nutrient intakes of Canadians.

The Canadian Health Measure Survey (CHMS) is conducted by Statistics Canada in partnership with Health Canada and the Public Health Agency of Canada. This national survey provides the first national data on the vitamin D status of Canadians in nearly 40 years. Cycle 1 of the survey was conducted over two years (2007 to 2009) and involved a sample of roughly 5500 Canadians from 15 sites across Canada. Preliminary data from the first 8 of 15 sites were released by Statistics Canada in July 2009. The full set of cycle 1 CHMS data was released by Statistics Canada in March 2010. An accompanying scientific paper published in Statistics Canada's Health Reports found that 90% of Canadians aged 6 to 79 had blood levels of vitamin D that were considered adequate for bone health and only 4% of Canadians were considered vitamin D deficient.

The IOM expert committee considered dose-response-relationship studies in the scientific literature to develop recommendations for adequacy (EARs and RDAs) and for preventing excessive intakes (ULs). Using national survey data, it assessed intakes of these nutrients in light of recommended intakes and safe upper limits (and, in the case of vitamin D, blood levels of vitamin D were used to assess vitamin D status). Finally, the committee outlined the implications of its work and identified research needs to aid development of DRIs for vitamin D and calcium in the future.

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