

Vitamin D Deficiency and Rickets



Endocrinology and Diabetes Clinic
4480 Oak Street, Vancouver, BC V6H 3V4
604-875-2117 1-888-300-3088 x2117
<http://endodiab.bcchildrens.ca>

Vitamin D Deficiency and Rickets

The major sources of vitamin D are dairy products, fortified soy milk and margarine, fatty fish and vitamin supplements. The body can also produce some vitamin D when the skin is exposed to sunlight. All vitamin D must be activated within the body to the form known as 1,25-dihydroxy-vitamin D.

Vitamin D deficiency generally occurs in older infants and toddlers because of poor intake of vitamin D in the diet. It can also occur in younger infants when a pregnant woman herself has vitamin D deficiency and doesn't pass enough vitamin D to her unborn baby.

Certain populations are at higher risk for vitamin D deficiency: people living in the North who see less sunshine; people who cover themselves for religious reasons; people who don't consume dairy or fortified soy products; and exclusively breastfed babies who don't take vitamin D supplements.

Breast milk itself is not an adequate source of vitamin D. While exclusive breastfeeding is now recommended for the first 6 months of life, breastfed babies require vitamin D supplementation **starting at birth**, until their vitamin D intake from other foods matches their requirements.

How much Vitamin D do we need?

Health Canada recommends the following daily intake of vitamin D, in International Units (IU):

Please see Appendix for Canadian Calcium and Vitamin D products.

Recommended Vitamin D Intake	
Age	IU of Vitamin D a Day
0–12 months	400
1–70 years	600

What are the symptoms of vitamin D deficiency?

Babies and toddlers with vitamin D deficiency generally present either with symptoms of a low blood calcium level (see above), or with an abnormality in their bones called rickets.

What is rickets?

Rickets refers to softness of the bones because of low calcium content. This leads to the following appearance:

1. Bowing of the legs and a "waddling gait" as the toddler begins to walk
2. Swelling and pain in the knees and wrists
3. Small swellings on the ribs and flaring of the bottom of the ribcage

How is vitamin D deficiency diagnosed and treated?

After speaking with you and examining your child, the doctor will do a number of blood tests to look at your child's blood levels of calcium, phosphorus and vitamin D. Your doctor may also ask for X-rays to look for evidence of rickets in the bones.

The doctor will then prescribe a high dose of vitamin D (see Appendix) to normalize your child's blood levels, and to help heal any

rickets. Your child may also need to take a calcium supplement for a while. You may be asked to see a dietitian who will give you advice about foods high in calcium and vitamin D.

Your doctor will monitor your child's blood tests and X-rays periodically, to ensure that they remain normal. Vitamin D deficiency is generally not permanent, provided your child continues to receive the recommended amount of vitamin D.

Questions from families

Q: How do you give calcium to a baby?

A: *There are many forms of calcium which may be used (see Appendix). Your doctor is planning to give your child a certain amount of elemental calcium per day.*

Calcium may be in a pre-mixed solution. NOTE THE INFORMATION ON THE CONTAINER AND SHAKE WELL IF INSTRUCTED. This means shaking hard for 2–3 minutes while watching the clock. Otherwise, the calcium settles out, and you are giving your child less than the recommended dose.

Calcium may be in the form of antacid tablets such as Tums®. Cut the tablet to the required size, crush and dissolve in milk or formula.

Q: Can I change my child's calcium to a cheaper product?

A: *Talk with your doctor and pharmacist before making a change. Each calcium product (see Appendix) has a different amount of elemental calcium. Some products have a low percentage of elemental calcium, and your child would have to take a large amount. Some products may have more side-effects, such as diarrhea.*

The calcium that your child takes has to be given 4 times each day, before each meal and at bedtime, to provide the body with a steady supply of calcium. It cannot be taken all at one time.

Q: My baby seems very fussy after I give her calcium.

A: *Some forms of calcium may be upsetting the stomach. Give the calcium as part of the feeding, not at the very beginning. It is also possible that your baby has a lax muscular connection between the esophagus (the food pipe) and the stomach, allowing the acid stomach contents to come up into the esophagus. This is called reflux. Your doctor may recommend a medication for this.*

Q: Can I use non-prescription vitamin D instead of calcitriol (Rocaltrol®) or alfacalcidol (One-Alpha®)?

A: *No! Vitamin D from the drugstore doesn't work in the body until it is turned into the activated form of vitamin D. Because of his or her medical condition, your child's body is not able to convert vitamin D into the activated form.*

Q: My son is booked for a surgical procedure soon. I've been told he should have nothing to eat or drink before the surgery. Does this include the calcium and calcitriol (Rocaltrol®) or alfacalcidol (One-Alpha®)?

A: *Speak with your endocrinologist about this— it can be dangerous to miss any doses. If the calcium level drops too low, the surgery will be cancelled. Often the doctor recommends taking all doses of medication with just a tiny sip of water.*

Q: What should I do if my child is vomiting and can't keep his medicine down?

A: *Since it can be dangerous to miss doses, you should speak to your endocrinologist about this.*

Q: I don't like giving my child medicine. Can I give her a special diet instead of

the calcium and Rocaltrol® or One-Alpha®?

A: *Every day a child's body needs calcium—between 700 and 1300 milligrams a day. While it remains important to have a diet with lots of calcium (dairy products, fortified soy milk, and green vegetables), that unfortunately won't be enough for your child, because her body cannot absorb calcium normally. Much of calcium in the foods she eats is lost through the digestive system, and so she needs supplements as well. One of the activated forms of vitamin D, either calcitriol (Rocaltrol®) or alfacalcidol (One-Alpha®), is also needed in order for the calcium from the diet and from supplements to be absorbed by the digestive system.*

As you can see, the process of treating your growing child with a disorder of calcium or phosphorus involves taking medications regularly and checking blood and urine to be sure the amounts are right for her. At first, it will take a lot of care, but soon it will become part of your everyday life, and you will be able to enjoy your child for the unique child that he or she is.

Websites and support groups for disorders of calcium and phosphorus

HealthLink BC: Food Sources of Calcium and Vitamin D:

<https://www.healthlinkbc.ca/healthlinkbc-files/sources-calcium-vitamin-d>

Medic Alert Canada:

<http://www.medicalert.ca>

More links are available from the

BC Children's Hospital Endocrinology & Diabetes Unit:

<http://endodiab.bcchildrens.ca>

Children with low blood calcium levels should wear a Medic Alert bracelet, to tell emergency personnel about potential calcium deficiency.

Appendix

Selected Canadian Calcium Products

Generic Name / Brand Name	Elemental Calcium
Tums® Regular 500 mg	200 mg/tab
Tums® Extra Strength 750 mg	300 mg/tab
Tums® Ultra Strength 1000 mg	400 mg/tab
Viactiv® Chews	500 mg/chew
BCCH Pharmacy suspension	80 mg/mL
Note: The regular Tums® tablet, for example, is called Tums® 500 mg. Since calcium carbonate is 40% elemental calcium, Tums® 500 mg actually contains only 200 mg of elemental calcium.	

Canadian Vitamin D Products

Generic Name	Trade Name and Dosages Available
Cholecalciferol (vitamin D ₃)	Multivitamins: most contain 400 IU Supplements: usually 400 IU or 1000 IU • Baby Ddrops®: 400 IU/drop • Kids Ddrops®: 400 IU/drop • Adult Ddrops®: 1000 IU/drop
Alfacalcidol (1-hydroxy-vitamin D)	One-Alpha®: • 0.25-microgram capsules • 1-microgram capsules • 2 microgram/mL (0.1 microgram/drop)
Calcitriol (1,25-dihydroxy-vitamin D)	Rocaltrol®: • 0.25-microgram capsules • 0.5-microgram capsules

Normal Levels of Common Lab Tests for a Child 6–12 Months of Age*

Test	Normal Range
calcium*	1.87–2.50 mmol/L
ionized calcium*	1.10–1.30 mmol/L
phosphorus*	1.29–2.58 mmol/L
magnesium*	0.78–1.03 mmol/L
intact PTH	1.0–5.5 pmol/L
alkaline phosphatase	110–320 U/L
25-hydroxy-vitamin D	25–110 nmol/L
1,25-dihydroxy-vitamin D	40–190 nmol/L
urinary calcium/creatinine ratio*	<1.69 mmol/mmol

*Normal levels vary depending on the age of the child and the lab method used.

Canadian Phosphorus Products

Generic Name	Trade Name and Dosage Available
Sodium phosphate monobasic	JAMP-Sodium Phosphate fizzy tablets: 500 mg or 16.1 mmol elemental phosphorus per tab
Sodium phosphate monobasic, dibasic	Phoslax® oral solution, 45-mL bottle: 129 mg or 4.15 mmol elemental phosphorus per mL
Potassium phosphate monobasic (Health Canada Special Access Programme)	K-Phos® Original 500-mg tabs: 114 mg or 3.68 mmol elemental phosphorus per tab
Potassium phosphate monobasic, dibasic	Potassium Phosphates Injection USP, 50-mL vial: 93 mg or 3.0 mmol elemental phosphorus per mL