

Pseudohypoparathyroidism

Pseudohypoparathyroidism (PHP) refers to a rare genetic condition in which the body makes normal (actually, excessive) amounts of PTH, but the PTH cannot work. This happens because the PTH receptors in the kidneys and bones that PTH normally interacts with are defective. In many cases, other hormone receptors are also defective, and the patient will have multiple hormone problems (including low levels of thyroid and puberty hormones).

There are a number of forms of PHP. The most common form, type 1A, is associated with a number of physical features, which together are known as Albright hereditary osteodystrophy (AHO). These are:

1. Marked short stature.
2. Obesity.
3. Round face.
4. Shortening of the hands and feet, especially of the 4th and 5th fingers and toes.
5. Developmental delay.

How is PHP diagnosed?

PHP is usually diagnosed clinically. Most patients will have low blood calcium level, but with a very elevated PTH level. Special DNA testing can confirm the diagnosis of PHP in many cases.

How is PHP treated?

The low calcium levels in PHP are treated the same as for simple hypoparathyroidism (see below), using calcium supplementation and either calcitriol (Rocaltrol®) or alfacalcidol (One-Alpha®).

How is hypoparathyroidism treated?

The parathyroid hormone is generally not replaced—it is an extremely expensive medication and must be given by injection. The low calcium level is treated by taking calcium pills or liquid. However, the calcium itself will not be absorbed into the digestive system unless the activated form of vitamin D is taken as well. Both calcium and the activated form of vitamin D, calcitriol (Rocaltrol®) or alfacalcidol (One-Alpha®) must be replaced in just the right amounts (see Appendix). The calcium must be taken frequently, possibly four times each day. If the child isn't taking enough calcium, the level can become so low that the child becomes extremely sick with seizures. This is an emergency, and the calcium will need to be given by intravenous.

Blood and urine tests must be done frequently at first (daily or weekly) to be sure that the calcium level is in the right range. Even after doses are just right, tests will be done every 2–3 months. Urine tests for calcium will show if extra calcium is being flushed from the body through the kidneys into the urine. Extra calcium and activated vitamin D can be harmful, as they can lead to side-effects such as calcium deposits in the kidneys (called nephrocalcinosis) or even calcium deposits in the blood vessels. Ultrasound scans of the kidneys may be recommended every year or two to watch for this problem.

What is pseudo-pseudohypoparathyroidism (PPHP)?

This term refers to the patient who has the physical features of AHO, but with normal calcium and PTH levels. PPHP and PHP are genetically related conditions.

Are PHP and PPHP hereditary?

In some cases, PHP and PPHP can be inherited from a parent. If this is suspected, your child's doctor can refer your family to a Medical Geneticist for further evaluation and counselling.

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

The Hypoparathyroidism Association:

<http://www.hypoparathyroidism.org>

Endocrine Web: Hypoparathyroidism:

<http://www.endocrineweb.com/hypopara.html>

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
<p>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.</p>	

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 <ul style="list-style-type: none"> • Baby Ddrops®: 400 IU/drop • Kids Ddrops®: 400 IU/drop • Adult Ddrops®: 1000 IU/drop
Alfacalcidol (1-hydroxy-vitamin D)	One-Alpha®: <ul style="list-style-type: none"> • 0.25-microgram capsules • 1-microgram capsules • 2 microgram/mL (0.1 microgram/drop)
Calcitriol (1,25-dihydroxy-vitamin D)	Rocaltrol®: <ul style="list-style-type: none"> • 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
<p>*Normal levels vary depending on the age of the child and the lab method used.</p>	

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