

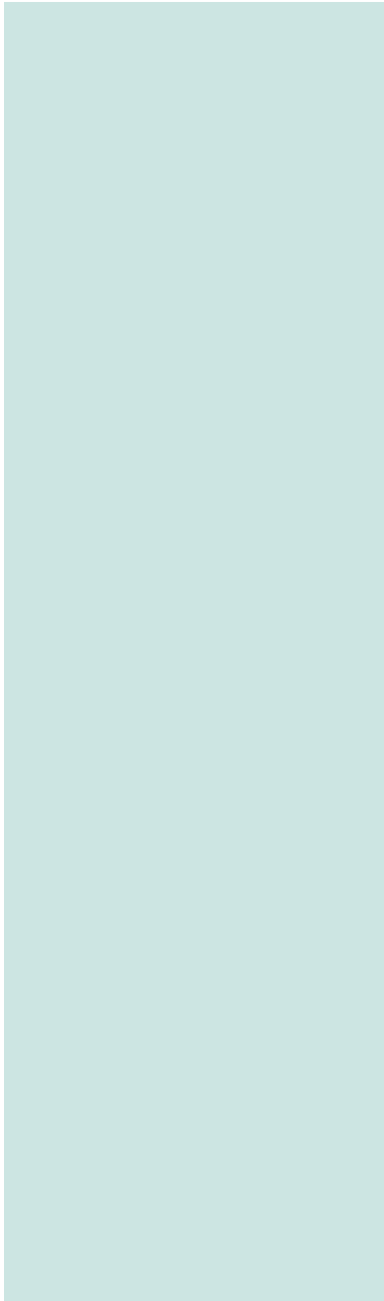
# Hypothyroidism



British Columbia  
**Children's Hospital**

*an agency of the Provincial  
Health Services Authority*





"I was so scared when the doctor told me our baby needed to take pills for her whole life, but now I know it's controllable & I'm not worried about her future."

Karen, mother



Most parents are upset and worried when they first hear that their child has a health problem that will need daily medication for life. But, you can take comfort in knowing that your child can develop and grow like any other healthy child. Hypothyroidism can be controlled with the correct daily dose of thyroid hormone and careful ongoing checkups. This book, and the health care team, will help you learn more about the condition.

## What is hypothyroidism?

*Note: There is enough iodine in our food to supply the thyroid gland. Taking iodine supplements will not increase the amount of thyroid hormone made by the gland.*

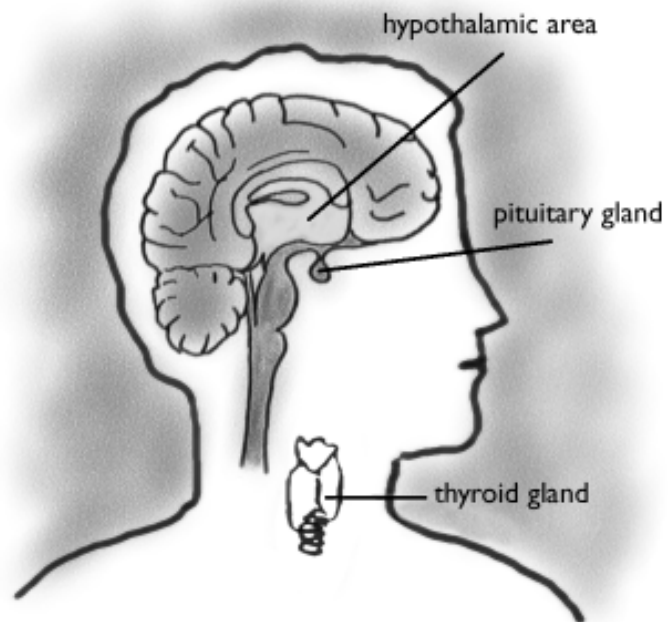
Hypothyroidism is a condition in which the body is not able to make enough thyroid hormones - thyroxine (T4) and triiodothyronine (T3) - for its needs. These hormones are made and stored in a small butterfly-shaped gland called the thyroid. It sits in the neck, in front of the trachea (windpipe), just below the larynx (voice box). The cells of the gland use iodine (found in iodized salt and some foods) to make the hormones.

The body relies on thyroid hormones for normal growth and development. These hormones also play an important part in getting the body cells to do their particular job at a rate that maintains health.

## How is the hormone produced?

The body controls the amount of hormone it produces. When it has enough it shuts off production. When it needs more it "switches on" production. (You can think of it like a furnace that switches on and off to produce the right amount of heat.) The "thermostat" for the thyroid hormones is the pituitary gland, a pea-sized gland tucked under the brain. When there is not enough thyroid hormone in the blood for the body's needs, the pituitary gland produces thyroid stimulating hormone (TSH).

TSH triggers the thyroid gland to produce more hormones. When there is enough thyroxine in the blood for the body's needs, the pituitary gland decreases TSH secretion and the production of thyroid hormone slows. The pituitary gland, in turn, becomes more or less active depending on the levels of thyrotropin-releasing hormone (TRH), that comes from a part of the brain called the hypothalamus.



## What causes hypothyroidism?

"I was afraid that I might have done something to cause this, but the doctor reassured me that it just happens sometimes."  
Janice, mother

**Congenital hypothyroidism.** About 1 in 4000 newborns have the condition. The thyroid gland develops in the very early weeks of the pregnancy. It forms from tissue at the base of the tongue that travels to the area below the voicebox. By about the eleventh week of pregnancy the gland can produce hormones. If the gland does not develop normally, or settles in the wrong position, it is unable to produce enough thyroid hormones. Medical science cannot yet say why the thyroid gland sometimes fails to develop normally. It just happens. It is not the result of anything the parents have, or have not, done.

In about 1 in 100,000 births, congenital hypothyroidism comes about because of a problem with the pituitary (TSH) or hypothalamic (TRH) hormone production.

**Acquired hypothyroidism** (also called Hashimoto's thyroiditis or chronic lymphocytic thyroiditis) occurs later in childhood. In this type of hypothyroidism, some of the body's own white blood cells destroy the cells of the thyroid gland so that it can no longer work efficiently. When the body's white cells attack other cells in the body as if they are germs or dangerous cells, it is called an autoimmune condition. The cause of this is not completely understood.

## What will happen if hypothyroidism is not treated?

*The brain needs a regular supply of thyroid hormone to mature at a normal rate in the early years.*

All body systems slow down when there is not enough thyroxine available to the tissues. For example, the rate at which cells divide and multiply to increase the body size is affected. Because of its key role, a lack of thyroxine in the newborn will have very serious effects if it is not treated:

- The brain development is slow. The earlier treatment is started, the better the baby's chance of reaching full mental potential.
- The baby sleeps more than usual, is quiet and passive rather than actively learning and responding to people and things.
- The baby's physical growth is slow because bones are not growing at their normal rate.
- The baby feeds poorly and the slow-moving digestive tract leads to constipation.

When hypothyroidism is acquired in later childhood the effects appear more gradually:

- The child's physical growth is poor because bone growth is slow.
- The child gains weight although eating poorly because calories are not being used at the normal rate.
- Constipation may be a problem.
- Skin and hair may be very dry.
- The child is tired all the time although getting enough sleep.

A child with hypothyroidism can go untreated for some time because the signs are missed or thought to be personality (a “quiet” child) or behaviour (a “lazy” child) rather than a physical condition.

- The child has little energy for play and lies around watching TV.
- The child’s schoolwork may reflect the slowing down.

Things will return to normal after the hormone is replaced.

## How is hypothyroidism diagnosed?

Hypothyroidism is diagnosed with a blood test that measures the hormones. A high level of TSH (see section on the hormone production) shows that the “thermostat” (pituitary gland) is working hard to trigger more action in the thyroid gland. Many countries do this measurement on all newborns from a blood sample taken from the heel. The same blood test is used for acquired hypothyroidism when the physician suspects this problem because of the symptoms (described above).

### **What tests help with a clear diagnosis?**

Your doctor will want to measure the amount of various hormones in the blood to find the source of the problem and to decide what treatment to suggest.

"My mom puts Emla®  
cream on my arm an hour  
before the blood test, so I  
don't feel the poke."  
Taeja, 9 years

**The blood tests are:**

T4 (free or total) measures the amount of thyroxine in the blood

T3 (free or total) measures the amount of triiodothyronine in the blood

TSH measures the pituitary gland's response to thyroid levels in the blood

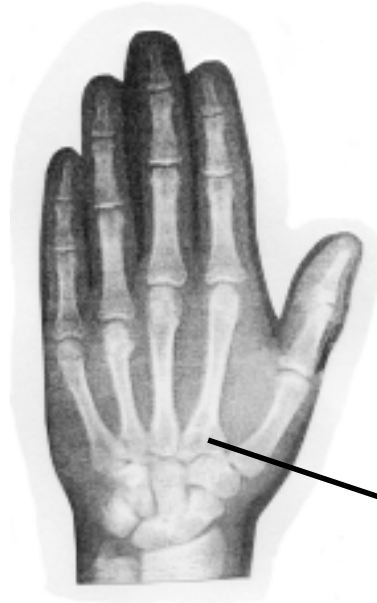
TBG (thyroid binding globulin) measures the protein that carries the thyroid hormones. Testing for this protein helps the doctor understand the levels of active thyroid hormone

TMA (thyroid microsomal antibodies) measures the activity of white cells that destroy the thyroid tissue.



Bones have growth plates at each end. By looking at these, the doctor can tell bone age.

The doctor may request a nuclear uptake scan or ultrasound to see the size and position of the thyroid gland. Sometimes the doctor asks for a "bone age". This Xray of the wrist or knee shows how much the bones have matured.



14 year old's hand

Growth plate

### **A psychoeducational assessment**

When congenital hypothyroidism is diagnosed quite late, some families are concerned that the child's learning is delayed. It may be helpful to check on this and get some suggestions for the best way to teach the child new skills.

## How is hypothyroidism treated?

It is treated by giving the child a daily dose of the correct amount of thyroxine to replace what the thyroid would normally produce. A pure, synthetic form of thyroxine (an exact replacement for the T4) called levothyroxine is available. It is sold under the names Synthroid®, Eltroxin®, Unithroid® and others. It is safe, with no bad side effects, when the dose is correct for the child. The dose will increase as the child grows. The small sweet-tasting pills are available in colour-coded strengths from 25 micrograms to adult strength (300 micrograms). The hormone levels in the blood suggest the correct dose, so these levels are measured often. In some situations, the doctor may also prescribe triiodothyronine (trade name Cytomel®) in addition to levothyroxine. This is a faster acting pill that clears from the blood more quickly. The need for hormone replacement is almost always lifelong.

### Example:

When Dorian had his newborn screening test, his TSH was 146 mU/L and his free T4 was 5 pmol/L. After 1 month of levothyroidism 37.5 mcg. daily, his TSH was 3.0 & his free T4 was 14 pmol/L. His doctor plans to continue levothyroidism, adjusting the dose as needed.

### Normal Hormone Values\*

	SI Units (Canada, Europe)	Conventional Units (USA)
T4 Free	8 – 16 pmol/L	0.6 – 1.2 ng/dL
TSH	0.3 – 6 mU/L	<b>0.3 – 6 µU/mL</b>

\*may vary depending on method & age of child

## Questions from parents

**Q: How do I give a pill to a newborn?**

*Caution:* Do not use a liquid form of hormone. It does not have the same strength in liquid form.

**Q: What should I do if I forget a pill?**

"I used to have trouble remembering to take my pills, but now I keep them beside my toothbrush & I never forget."  
Pamela, 12 years

**Q: Can you cut down on the number of blood tests?**

A: Crush with a pill crusher. Dissolve it in ½ teaspoon of breast milk, formula, or sterile water. (Don't use a soy-based formula. Soy prevents the hormone from being absorbed into the blood.) Pour the mixture into an oral syringe or small spoon. Do not put the pill in a bottle. The child may not take the whole bottle and then does not get a full dose.

Older children may prefer to swallow the pill whole.

A: Give the pill at the same time each day. Link it to something that happens always e.g. bathtime, last nightly feed. You are less likely to forget to give it if it is part of a routine. If you do miss a dose, give it as soon as you remember, returning to your regular schedule the next day. If you do not remember until the next day, do not double dose. Give only the daily dose. The thyroxine stays in the body a long time so you can't see the effect of missing a dose. Many busy parents find that a "see-through" plastic pill dispenser is a handy reminder. These are available at any drugstore for less than \$5.00

A: Blood levels are the only way to get the information for accurate dosing of replacement hormones. Too much or too little thyroid hormone is not good for your child, so, it is not wise to delay blood tests. The health care professional will let you know how often a blood test is

***Q: If my child's behaviour changes does this mean the dose needs changing?***

needed. If your child is afraid of needles you can buy a non-prescription cream, such as EMLA® to numb the skin so the needle hurts very little (not advised for infants).

A: Blood tests are the best guide to the dose of hormone replacement. But, if the child's behaviour changes, and you cannot explain it as just a few bad days, or a rocky patch, discuss this with your doctor.

***Q: Are there any "natural" remedies for hypothyroidism?***

A: Hormones made by, and in, the body are chemicals. They are part of the "natural" chemistry of our bodies. So, the chemical thyroxine is as close to the "natural" as it is possible to get. It is identical to the hormone produced by the thyroid.

The body cannot make thyroxine from plants or herbs.

***Q: Will my child develop normally?***

A: The answer to this is yes. Your child will grow and develop like any other healthy child if he or she:

- gets hormone replacement early
- gets the correct dose of thyroid hormone
- has and ongoing checkups to ensure the dose remains correct.

## Websites and Support Groups for Hypothyroidism

### **Endocrine Web Thyroid Links**

[www.endocrineweb.com/thyroid.html](http://www.endocrineweb.com/thyroid.html)

### **Magic Foundation**

[www.magicfoundation.org/congthyr.html](http://www.magicfoundation.org/congthyr.html)

[www.magicfoundation.org/clin hypo.html](http://www.magicfoundation.org/clin hypo.html)

### **Thyroid Foundation of Canada**

[www.thyroid.ca](http://www.thyroid.ca)

More links are available from:

### **The Department of Endocrinology at**

### **B.C.'s Children's Hospital**

[www.cw.bc.ca/endodiab/endolink.asp](http://www.cw.bc.ca/endodiab/endolink.asp)

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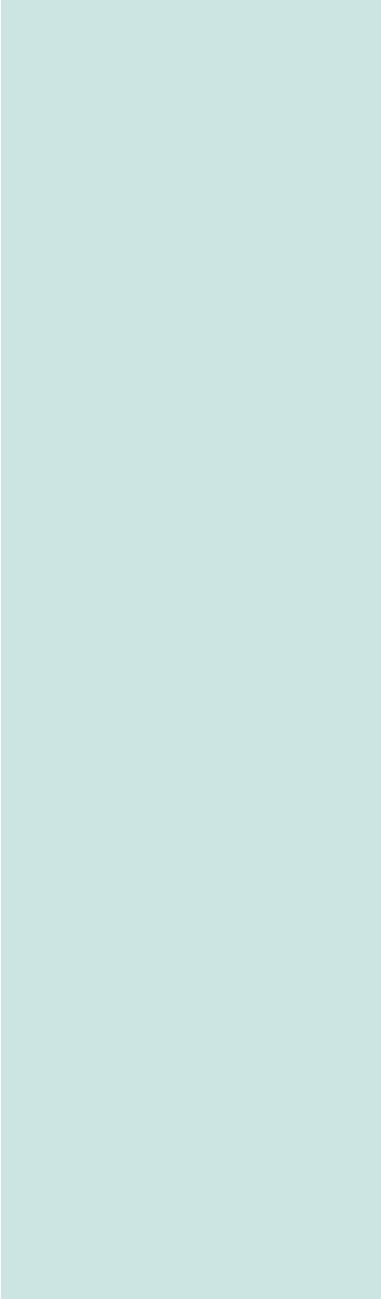
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