

ATA Hypothyroidism Booklet

This booklet was prepared by the American Thyroid Association (ATA), a professional society of physicians and researchers specializing in the thyroid gland. Founded in 1923, the ATA fosters excellence and innovation in patient care, research, education, and public advocacy.

The recommendations given here are those of the ATA. This advice cannot apply to every patient, and your doctor may make different suggestions. If you have any questions or concerns, check with your doctor.



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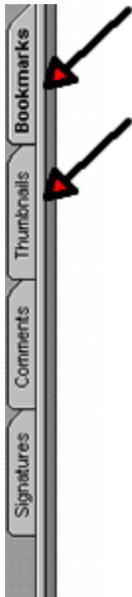
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Tips on Navigating the Hypothyroidism Booklet:

Words highlighted in blue in the document text are defined in the section entitled “Medical terms in this booklet.” Clicking on the term will take you to the definition. To return to the page you were on, click on the left-facing black arrow in the Acrobat® tool bar at the top of the screen (see figure below), or right click on the page with your mouse and choose “Go to Previous View.”



To navigate to a specific section of the Hypothyroidism Booklet click on the Bookmarks tab on the left-hand side of the window and select the section you want to read. To close the Bookmarks palette click the Bookmarks tab again.

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What is the thyroid?

The thyroid gland is a butterfly-shaped [endocrine](#) gland that is normally located in the lower front of the neck. The thyroid's job is to make thyroid [hormone](#). The main thyroid hormone is [thyroxine](#), also called **T4** because it contains four [iodine](#) molecules. Thyroid hormone is carried through the blood to every tissue in the body. Thyroid hormone is essential to help each cell in each tissue and organ to work right. For example, thyroid hormone helps the body use energy, stay warm, and keep the brain, heart, muscles, and other organs working as they should.

What is hypothyroidism?

[Hypothyroidism](#) is an underactive thyroid gland (“hypo-” means “under” or “below normal”). Hypothyroidism means that the thyroid gland cannot make enough thyroid hormone to keep the body running normally. People are hypothyroid if they have too little thyroid hormone in their blood. Common causes are [autoimmune disease](#), surgical removal of the thyroid, and radiation treatment. Low thyroid hormone levels cause the body's functions to slow down, leading to general symptoms like dry skin, fatigue, loss of energy, and memory problems. Hypothyroidism is diagnosed by a simple blood test for [thyroid-stimulating hormone](#) (TSH). Hypothyroidism is treated by replacing the missing thyroid hormone with [synthetic](#) thyroxine pills, which the person must take every day for life. With daily treatment, most patients recover completely.

Symptoms

When thyroid hormone levels are too low, the body's cells can't get enough thyroid hormone and the body's processes start slowing down. For example, the body makes less heat and less energy, and organs like the brain and bowels move more slowly. As the body slows, you may notice that you feel colder, you tire more easily, your skin is getting drier, you're becoming forgetful and depressed, and you've started getting constipated.

You may also have body changes that you *can't* feel. For example, you may not know that cholesterol is building up in your blood and “plaque” is hardening your arteries, increasing your risk for heart attack. So hypothyroidism doesn't just cause symptoms. It can make other conditions worse.

Some people develop hypothyroidism quickly over a few months. Some people develop it slowly over many years. In general, the lower thyroid hormone levels become and the longer they stay low, the more severe the symptoms will be. Subclinical (mild) hypothyroidism may cause mild symptoms or none at all. Severe hypothyroidism usually causes severe symptoms (see “[What happens if hypothyroidism isn't treated](#),” below). But no one can predict exactly which symptoms a person will develop or how severe they'll be. Some people are very sick by the time they learn their diagnosis; others whose blood tests show severe hypothyroidism have few if any symptoms.

Because the symptoms are so variable, the only way to know for sure whether you have hypothyroidism is with blood tests.

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Common features of hypothyroidism

Less energy

More fatigue, trouble awakening in the morning, need for more sleep, and tendency to fall asleep during the day

Feeling cold when other people feel warm

Less sweating

Drier, itchier skin

Yellow or orange skin, caused by a build-up of the pigment carotene from fruits and vegetables

Drier, coarser, more brittle hair

More hair loss (the amount differs in different people; patients don't go bald but their hair can look thin)

Loss of appetite

Mild weight gain (5-20 pounds) and difficulty losing weight (hypothyroidism doesn't cause obesity)

New or worsening problems with memory, slower thinking

New snoring

More frequent and severe muscle cramps and joint aches

New feeling of pins and needles in the hands and feet ([paresthesia](#))

New constipation

New puffiness around the face (especially the eyes), hands, ankles, and feet because of fluid build-up

Carpal tunnel syndrome

Heavier and/or more frequent menstrual periods, worse cramps, worse premenstrual symptoms

Feeling irritable

New depression—sadness or not caring about anything

New hoarse voice

New hearing loss

[Goiter](#) (swelling in the front of the neck, caused by enlargement of the thyroid; goiter is most likely to be part of [Hashimoto's thyroiditis](#))

Shrinking thyroid (most likely in [atrophic thyroiditis](#))

Slowing of heart rate, reducing the blood flow and oxygen delivered to body tissues

Slightly higher blood pressure, caused by stiffening of arteries

Higher cholesterol levels

Causes

There can be many reasons why the cells in the thyroid gland can't make enough thyroid hormone. Here are the major causes, from the most to least common:

Autoimmune disease

The [immune system](#) normally protects the body against bacterial and viral “invaders.” In [autoimmune diseases](#) (“auto” means “self”), the immune system mistakenly attacks a normal part of the body. In autoimmune hypothyroidism, the immune system accidentally attacks cells in the thyroid gland, interfering with their ability to make thyroid hormone. When enough thyroid cells have been destroyed, too few are left to meet the body's need for thyroid hormone. Autoimmune thyroid disease is more common in women than men. It can start at any age, but becomes more common as people get older. In women, it often begins during pregnancy, after delivery, or around menopause. The cause is probably a combination of an inherited tendency and an as yet unknown trigger. No one knows whether stress plays a role. [Autoimmune thyroiditis](#) can begin suddenly, but in most patients it develops slowly over years. The most common forms are [Hashimoto's thyroiditis](#) and [atrophic thyroiditis](#).

Surgical removal of part or all of the thyroid gland

Some people with thyroid [nodules](#), thyroid cancer, or [Graves' disease](#) need to have part or all of their thyroid removed. If the whole thyroid is removed, people will definitely become hypothyroid. If only part of the thyroid is removed, the remaining part may:

- work well enough to keep thyroid hormone blood levels normal throughout the person's life
- never make enough thyroid hormone to keep blood levels normal
- at first make enough thyroid hormone, but later become unable to meet the body's need for hormone

Radiation treatment

Some people with Graves' disease, nodular goiter, or thyroid cancer are given [radioactive iodine \(I131\)](#) to destroy their thyroid gland purposely. Patients with Hodgkin's disease, lymphoma, or cancers of the head or neck are treated with radiation. All these patients can lose part or all of their thyroid function.

Congenital hypothyroidism(hypothyroidism that a baby is born with)

A few babies are born without a thyroid or with a partly formed thyroid. A few babies have part or all of their thyroid in the wrong place ([ectopic thyroid](#)). In some babies, the thyroid cells or their [enzymes](#) don't work right. Babies with any of these problems may be hypothyroid from birth. In some, the thyroid may make enough hormone for a while and then may no longer be able to keep up with the need, so the person becomes hypothyroid as an older child or even as an adult.

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Thyroiditis

Thyroiditis is an [inflammation](#) of the thyroid gland, usually caused by an autoimmune attack (in [postpartum thyroiditis](#) or [silent thyroiditis](#)) or by a viral infection. Thyroiditis can make the thyroid release its whole supply of stored thyroid hormone into the blood at once, causing brief [HYPERthyroidism](#) (an overactive thyroid); once all of the stored hormone has been released, the thyroid becomes underactive. Almost all patients with viral thyroiditis recover their thyroid function, but about one-fourth of patients with autoimmune thyroiditis have permanent hypothyroidism.

Medicines

Medicines like amiodarone, lithium, interferon alpha, and interleukin-2 can interfere with the thyroid gland's ability to make thyroid hormone. These drugs are most likely to trigger hypothyroidism in patients who have a genetic tendency to autoimmune thyroid disease. It's also possible that treatment with thalidomide for multiple myeloma can cause hypothyroidism.

Too little or too much iodine

The thyroid gland must have [iodine](#) to make thyroid hormone. Iodine comes into the body in foods, mainly dairy products, chicken, beef, pork, fish, and iodized salt. The iodine then travels through the blood to the thyroid. Keeping thyroid hormone production in balance requires the right amount of iodine. People who live in undeveloped parts of the world may not get enough iodine in their diet. Worldwide, iodine [deficiency](#) is the most common cause of hypothyroidism, although it is a rare cause in the U.S. (see "[Hypothyroidism caused by iodine deficiency](#)," below). Taking in too *much* iodine can also cause or worsen hypothyroidism. The major source of too much iodine is dietary supplements containing kelp, a kind of seaweed. Most such supplements are sold with the false promise of helping people lose weight. Other sources of too much iodine are x-ray dyes, medicines like amiodarone, and some older expectorants (medicines that help clear the lungs and throat).

Damage to the pituitary gland

The [pituitary](#) tells the thyroid how much hormone to make. If the pituitary is damaged by a tumor, radiation, or surgery, it may no longer be able to give the thyroid the right instructions, and the thyroid may stop making enough hormone.

Rare disorders that infiltrate the thyroid

In a few people, diseases deposit abnormal substances in the thyroid. For example, amyloidosis can deposit amyloid protein, sarcoidosis can deposit granulomas, and hemochromatosis can deposit iron. These deposits can prevent the thyroid from working right.

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What does not cause hypothyroidism?

- Soy does not cause hypothyroidism, but it does interfere with the body's ability to absorb thyroid replacement therapy.
- The amounts of broccoli, cabbage, and brussels sprouts that people eat in a normal diet do not cause hypothyroidism.
- There is no evidence that some people's thyroid gland makes enough hormone but it does not get to the body's cells.

Who is at risk?

Hypothyroidism is one of the most common thyroid disorders. It affects people all over the world, of every age, sex, race, and level of wealth and education. About 2-3% of Americans have pronounced hypothyroidism, and as many as 10-15% have subclinical (mild) hypothyroidism. More than half of people who have hypothyroidism don't know it.

The most common cause of hypothyroidism is autoimmune disease. Risk factors for autoimmune hypothyroidism are:

- Family history: Having a relative with autoimmune thyroid disease
- Older age: Hypothyroidism can start at any age, but the risk keeps growing as people get older
- Being female: Hypothyroidism is more common in women than men. It is much more common in young women than young men, but as men get older, they start to catch up
- Being white or Asian: Hypothyroidism is common in whites and Asians. African-Americans are at lower risk
- Having another autoimmune disorder, such as type 1 diabetes, rheumatoid arthritis, multiple sclerosis, celiac disease, Addison's disease, pernicious anemia, vitiligo, or even prematurely gray hair
- Having Down syndrome or Turner's syndrome
- Having bipolar disease (manic-depression)

The rate of hypothyroidism goes up:

- During pregnancy
- After delivery
- Around menopause

Can hypothyroidism be prevented?

In countries where the diet does not contain enough iodine, taking iodine supplements can prevent hypothyroidism (see "[Hypothyroidism caused by iodine deficiency](#)," below). In developed countries like the U.S., where most people's diet contains enough iodine, there is no known way to keep from getting hypothyroidism.

The best way to prevent hypothyroidism from becoming severe is to diagnose it early by testing newborn babies, pregnant women, and people who have symptoms or risk factors. The biggest risk factor is having relatives with thyroid disease.

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Diagnosis

The correct diagnosis of hypothyroidism depends on:

- the patient's symptoms, medical history, risk factors, and family history
- the physical exam
- blood tests for [TSH](#) and the [free T4](#) or [free T4 index](#)

Symptoms

Hypothyroidism has no characteristic symptoms. There are no symptoms that everyone with hypothyroidism always has but that no one with another disease ever has. This makes hypothyroidism hard to diagnose just by its symptoms. Most hypothyroid symptoms are common complaints that many people with a normal thyroid can have. These symptoms may not signal any serious underlying disease or they might be clues to a number of serious conditions related or unrelated to the thyroid.

If people have hypothyroidism but do not know it, they may go to many doctors trying to find out what's wrong with them. They may go to the dermatologist saying that their skin is dry, or to the gynecologist worrying about why their periods have gotten heavier, or to a psychiatrist saying they're depressed. It can work the other way, too: People might have some of the symptoms of hypothyroidism and think that's what's wrong with them, but it turns out that the symptoms are being caused by some other condition. For example, tiredness might really be caused by [anemia](#).

Hypothyroidism can also be hard to diagnose because in most people it develops slowly. One way to help figure out whether your complaints are symptoms of hypothyroidism is to think about whether you've always had a symptom (hypothyroidism is less likely) or whether the symptom is a change from the way you used to feel (hypothyroidism is more likely).

Medical and family history

You should tell your doctor:

- about changes in your health
- if you've ever had thyroid surgery
- if you've ever had radiation to your neck to treat cancer
- if you're taking any of the medicines that can cause hypothyroidism: amiodarone, lithium, interferon alpha, interleukin-2, and maybe thalidomide
- whether anyone in your family has thyroid disease; this makes it more likely that you do, too

Physical exam

The doctor will check your thyroid gland and look for changes like dry skin, swelling, slower reflexes, and a slower heart rate.

Blood tests

TSH test

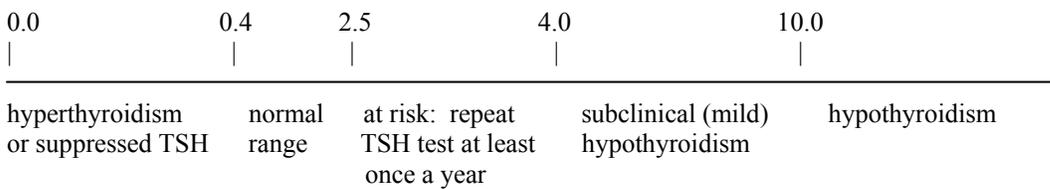
TSH (thyroid-stimulating hormone) is the most important and sensitive test for hypothyroidism. TSH is a simple blood test that measures how much T4 the thyroid gland is being asked to make. An abnormally high TSH means hypothyroidism: The thyroid gland is being asked to make more T4 because there isn't enough T4 in the blood.

What is TSH (thyroid-stimulating hormone)?

Your thyroid needs to be told how much thyroid hormone to make. The instructions come from the **pituitary gland** below your brain. The system works as a **feedback loop**: Special cells in your pituitary gland determine the normal T4 range for your body—your **set point**. As blood flows through your pituitary, these cells measure the T4 levels and can tell whether or not they are at your set point.

The pituitary cells communicate with your thyroid gland by sending their own hormone, TSH (thyroid-stimulating hormone), into the blood. When your T4 levels are at your set point, the pituitary sends out enough TSH to tell the thyroid gland to keep making the same amount of T4. If your T4 levels get low, the pituitary sends out more TSH to tell the thyroid to make more T4. The lower your T4 levels go, the higher your TSH goes, as your pituitary asks your thyroid to work harder and make more T4. The opposite is also true: If your T4 levels get too high, the pituitary sends out less TSH, telling your thyroid to make less T4.

Figure 4: Normal and abnormal TSH levels (mU/L)



In most labs, the normal range for TSH is 0.4 mU/L to 4.0 mU/L (Figure 4). If your TSH is above 4.0 mU/L on both a first test and a repeat test, you probably have hypothyroidism.

Most people whose thyroid works normally have a TSH between 0.4 and 2.5 mU/L. If your TSH is above 2.5 mU/L, your doctor should test your blood for **anti-thyroid peroxidase (anti-TPO) antibodies**. If you have these antibodies, your immune system may be attacking your thyroid and you may be at risk for developing hypothyroidism. You should have the TSH test repeated at least once a year. There is no need to repeat a positive anti-TPO test.

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Remember: As the T4 falls, the TSH rises (as the thyroid hormone supply falls, the demand increases). As the T4 rises, the TSH falls (as the supply rises, the demand falls).

There is one exception to the rule that everyone with hypothyroidism has a high TSH. If the pituitary stops working right, it may not be able to send out normal amounts of TSH. The thyroid may be healthy, but if it does not get enough TSH, it won't make enough T4. This disorder is called [secondary hypothyroidism](#). Fortunately, it is quite rare.

T4 tests

Most of the T4 in the blood is attached to a protein called thyroxine-binding globulin. This “bound” T4 cannot get into body cells. Only about 1-2% of T4 in the blood is unattached (“free”) and can get into cells. The free T4 and the free T4 index are both simple blood tests that measure how much unattached T4 is in the blood and available to get into cells.

Ways that hypothyroidism *can't* be diagnosed

- *Low body temperature* is not a reliable measure of hypothyroidism. Some hypothyroid patients—but also many healthy people—regularly have a temperature well below 98.6 degrees F.
- *Reflexes* may be slowed in hypothyroidism, but in many other conditions, too.
- *Saliva tests* for thyroid disease are not accurate.
- *Swelling in the base of the neck*: An underactive thyroid may look like a normal thyroid, or it may be larger or smaller. Even if your thyroid looks normal, you can have thyroid disease.

Treatment

Thyroxine (T4) replacement

Hypothyroidism can't be cured. No one has discovered a way to make the thyroid gland start to work normally again. But with daily treatment, *taken every day for life*, hypothyroidism can be completely controlled in almost every patient. It's treated by replacing the amount of hormone that your own thyroid can no longer make, to bring your T4 and TSH back to normal levels. So even if your thyroid gland can't work right, T4 replacement can restore your body's thyroid hormone levels and your body's function. Synthetic thyroxine pills (also called L-thyroxine or levothyroxine) contain hormone exactly like the T4 that the thyroid gland itself makes.

One reason that thyroxine treatment works so well is that, like the T4 that your own thyroid gland makes, each dose of synthetic thyroxine keeps working in your blood for a very long time—about a week. This lets your blood T4 levels stay steady so a constant supply of T4 is available to your body cells. (Thyroxine takes about 4 weeks to clear completely from the body.)

All hypothyroid patients except those with severe hypothyroidism ([myxedema](#)) can be treated as outpatients, not needing to go into the hospital.

Who should treat you

Many hypothyroid patients can be treated effectively by their primary care doctor. You might need to see an [endocrinologist](#) or [thyroidologist](#) for a second opinion or for regular care if:

- You have [congenital hypothyroidism](#) or another unusual cause for your hypothyroidism
- You have [autoimmune polyglandular syndrome](#)—autoimmune hypothyroidism combined with one or more other autoimmune conditions, most often type 1 diabetes, [Addison's disease](#), or [premature ovarian failure](#)
- You have another condition, like epilepsy, heart disease, or bowel disease, that affects the treatment of your hypothyroidism
- You have trouble settling into the right dose of thyroxine
- You have many questions and concerns that your regular doctor can't answer or can't take the time to answer

How your thyroxine dose is decided

When you're first diagnosed with hypothyroidism, your doctor will choose your starting dose of thyroxine based on your:

- Weight: The heavier you are, the higher the dose may be.
- Age: Older people should start on a low dose and raise it slowly, to give their body time to adjust. Because older people's bodies clear drugs more slowly, they generally stay on lower doses.

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- Cause of your hypothyroidism: If your thyroid has been removed, all of your T4 must be replaced. If your hypothyroidism is caused by autoimmune disease, your thyroid is still probably making some hormone, so you can take a lower dose. If you have had thyroid cancer, you need a higher-than-usual dose to keep your TSH near zero ([suppressive treatment](#)) and prevent the cancer from growing back.
- Other conditions that you have: If you have celiac disease or Crohn's disease, you may have trouble absorbing thyroxine and you may need a higher dose. If you have heart disease, you should start with a very low dose and raise it slowly.
- Other medicines that you're taking: If you take birth control pills, hormone replacement therapy, Zoloft®, Tegretol®, Dilantin®, or phenobarbital, you may need a higher dose. If you take testosterone, or possibly niacin, you may need a lower dose.

Your starter dose will probably have to be changed later—not necessarily because your hypothyroidism has worsened, but because that first dose was just your doctor's educated guess. Your doctor may purposely start you on a low dose to prevent you from getting symptoms of too much thyroxine, like anxiety, restlessness, nervousness, and a racing heart. The doctor may then raise your dose gradually.

Because thyroxine is a slow-acting hormone, it may take several weeks before your body adjusts to the pills and you start to feel their effects. After about 6 to 10 weeks, your body will have adjusted enough that your doctor can test your TSH again to see whether it has gone down. If your TSH is still high and you still have symptoms, your doctor may raise your thyroxine dose and then give you 6 weeks or more to adjust to it before testing your TSH again.

This pattern may repeat several times before you settle into the right dose. Every patient responds differently to thyroxine replacement, and you may need a higher or lower dose than someone else who started out with the same TSH as you. You *will* reach a stable dose, and you may stay on that dose for many, many years.

You must take your assigned dose every day. (It might be the same dose every day, or you might be told to take different doses on different days.) That's the only way that your doctor can measure accurately how your TSH is responding to treatment—and it's the only way that you'll get and stay better. Some patients who have hypothyroidism without any symptoms say that they don't want to have to take pills because they feel fine. They still need to be treated because their body functions are slowing down even if they can't feel it.

Many hypothyroid people are taking too high or too low a dose of thyroxine. Getting the right dose for you is just a matter of taking your pills as prescribed and getting regular blood tests. A small change in your thyroxine dose can make a big change in how you feel and function. If you're on the right dose, all your symptoms caused by hypothyroidism should disappear.

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How to take your pills

What's most important is that you start treatment right away and remember to take your pill every day – *every* day. Thyroxine isn't like an antibiotic that you take for a few days until you feel better. Thyroxine replaces the hormone that your thyroid can no longer make. The only way to control your hypothyroidism is to take your pill every day for the rest of your life. If you stop taking your pills for any reason, your hypothyroidism will return.

You should take your pill at about the same time every day. First thing in the morning or last thing at night works well for many people. You may remember to take your pill more easily if you combine it with a routine like brushing your teeth.

When you're supposed to take a pill every day, it's easy to forget whether you've taken today's pill. To keep track more easily, you can store your pills in a container that has a little box marked for each day of the week. Whatever container you use, keep it tightly closed so your pills stay dry. Store your pills in the room where you'll best remember to take them. As with all medicines, keep thyroxine out of the reach of children.

You can take your pill with any liquid except soy milk. Cow's milk is probably fine. Grapefruit juice is fine. Don't try to swallow your pill without liquid; it can dissolve in your mouth or throat, and then not enough medicine will be absorbed into your blood.

It doesn't matter whether you take your pill on an empty stomach or with food, as long as you always do the same thing. If you always take your pill with food, you'll probably need a higher dose than if you always take it on an empty stomach. Foods and medicines can interfere with the body's ability to absorb thyroxine. In particular, wait 4 hours after taking thyroxine before you:

- Eat foods that contain soy, including soy formula for babies
- Take calcium supplements (regular amounts of cow's milk are probably OK), iron supplements, or antacids that contain either calcium or aluminum hydroxide
- Take medicines like cholestyramine (Questran®), colestipol (Colestid®), or sucralfate (Carafate®)

Thyroxine does not interfere with the body's ability to absorb other drugs.

Giving thyroxine to babies

You can crush the pill between two spoons, mix it with a little water or breast milk, and immediately squirt it inside the baby's cheek with a medicine dropper. Then you should nurse or bottle-feed the baby. (Don't crush the pill in a milk bottle. It doesn't dissolve; it just sits in the bottle, losing its strength and clogging up the nipple. Thyroxine weakens quickly when it's put in liquid.)

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Giving thyroxine to children who can't swallow pills

You can give the pill the same way that you would to a baby. Or you can put the pill in a small paper cup, with just enough water to dissolve the pill. Have the child drink the solution. Then put a little more water in the cup to catch any more bits of the pill, and have the child drink that.

Why you should always take the same brand of thyroxine

The available brands of thyroxine are Synthroid®, Levothroid®, Levoxyl®, and Unithroid®. The U.S. Food and Drug Administration (FDA) regulates all four brands. All are safe and effective. Each brand contains the same active ingredient—thyroxine (T4)—but each is made a little differently. Because these small differences affect the way that the body absorbs the drug, the FDA has not ruled that these products are interchangeable (you can't just substitute one for another). If you change from one brand to another, even at the same dose, your body may absorb and respond to it differently. This means that if you switch to a new drug, you need a TSH test 6 to 12 weeks later and your new dose may need to be adjusted.

The American Thyroid Association recommends that once you get used to one brand of thyroxine, you stick with that brand. The Association also recommends that you be given a brand name drug rather than a generic, because every time you fill your generic prescription, you may be given a different product. Every time you pick up your pills, you should make sure that the pharmacist has given you the same brand.

Thyroxine comes in many different strengths, each with its own pill color. When you get your pills, make sure you've been given the right strength.

Many patients have to take two thyroxine pills—sometimes of two different strengths—to get the right dose. For example, thyroxine pills aren't made in a strength of 163 mcg. If your dose needs to be 163 mcg, your doctor might give you prescriptions for 75-mcg pills and for 88-mcg pills. Some pharmacies charge the two strengths as two separate prescriptions. If you check around, you may find a pharmacy that charges the two strengths as a single prescription.

If you miss a pill

If you miss just one pill, it isn't too serious because thyroxine stays in your blood for such a long time. If this afternoon you remember that you didn't take this morning's pill, take it now. If today you remember that you didn't take yesterday's pill, you can take two pills in one day. But you might feel better if you don't take both doses at once. If possible, take one of the pills in the morning and the other one in the evening. You can probably also safely skip one pill.

If you vomit up a pill because you have the flu, don't take an extra pill. Wait and take your next regular dose tomorrow. If you vomit up a pill because you're pregnant, you might want to try taking your pills at bedtime, when you're less likely to feel sick.

If you miss one thyroxine pill every week, it's much more serious. It's as though you're taking a lower dose of thyroxine. (For example, say that you're supposed to take 100 mcg a day, which adds up to 700 mcg a week. If you miss one pill every week, you're taking only 600 mcg a week, or 86 mcg a day. If you miss two pills every week, you're taking only 500 mcg a week, or 71 mcg a day. If your doctor prescribed 100 mcg a day, your body needs all that thyroxine.)

If you miss lots of pills, don't try to make them all up. Just start over with daily pills and figure out how you'll best remember to take them.

Keep track of how often you miss your pills, so you can tell your doctor next time your TSH is tested.

If you get pregnant

Keep taking your regular thyroxine dose. Thyroxine is completely safe when you're pregnant. In fact, you need it more than ever because you must provide T4 for both yourself and your developing fetus (see "[What happens if hypothyroidism isn't treated?](#)" below).

You should see your doctor as soon as you find out you're pregnant—or, even better, before you decide to become pregnant. You should work closely with your doctor throughout your pregnancy to ensure the best possible health for yourself and your baby. Your doctor should test your TSH several times while you're pregnant, and may raise your thyroxine dose by as much as 30 to 50% because your body needs more T4 to handle the physical demands of pregnancy. After your baby is born, your body returns to needing the same amount of T4 as before you got pregnant, so your thyroxine dose should be lowered.

Many experts recommend that all women be tested for thyroid disease if they are thinking of becoming pregnant or as soon as they learn that they are pregnant. If you are diagnosed with hypothyroidism during your pregnancy, you must begin thyroxine treatment right away and continue treatment and testing at least every 6 to 8 weeks until you deliver. Then your TSH levels will determine whether you need to continue treatment.

Should patients with subclinical (mild) hypothyroidism be treated?

Subclinical (also called “mild”) hypothyroidism is now defined as a T4 in the normal range, but with a slightly high TSH of 4.0 to 10.0 mU/L, usually causing few or no symptoms. Experts don’t agree on whether to treat people with subclinical hypothyroidism. Some doctors treat all of these people. Some treat only those who have symptoms. Some treat those with anti-TPO antibodies or a high cholesterol. Some do not treat at all, but keep testing patients to see whether their TSH rises higher.

There is no harm in treating patients with subclinical hypothyroidism, as long as they are given the correct thyroxine dose. Research is still needed on whether patients do better if they’re treated and whether they’re harmed if they’re not treated. It’s possible that even subclinical hypothyroidism can increase people’s risk for heart problems.

People with a TSH in the high-normal range of 2.6 and 4.0 mU/L should also keep being tested to see whether their levels rise to the level of hypothyroidism.

How helpful are treatments combining T4 with T3?

A normal thyroid gland makes two thyroid hormones, T4 and T3—but 14 times as much T4 as T3. When tissue cells remove T4 from the bloodstream, they change some of it into T3. In fact, more than 80% of the T3 in your blood is made from T4 that has been changed by the liver and other tissues outside the thyroid. Underactive thyroids still make both T4 and T3—just not enough. Because the failing thyroid still makes some T3, and because body tissues turn some T4 into T3, most hypothyroid patients need to be treated only with T4. In most such patients, having the right amount of T4 allows the body to make the right amount of T3. All the U.S. thyroxine brands contain only T4.

Some researchers and patients have wondered whether a combination of T4 and T3 might be better. Early studies have shown that some patients felt better on the combination, but the improvement didn’t last.

One problem is that the only FDA-approved brand of T3 works in the body for just a few hours—unlike T4, which works for a week. This means that patients taking T3 need several doses a day. Another problem is that taking T3 pills interferes with the body’s normal ability to adjust T3 levels, so the T3 levels that the pills give to patients can’t match the body’s normal patterns. This makes some patients actually feel worse on combined therapy.

A T4-T3 combination might be of some help to people who have had their whole thyroid removed and can’t make any T4 or T3 of their own. If patients want to try a T4-T3 combination, the American Thyroid Association recommends that their doctor give them at most 5 mcg of T3 twice a day, and, in turn, reduce their T4 dose. Taking too much T3 can seriously harm the heart.

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Thyroxine from animals

Thyroid hormone taken from pigs has been used for about 100 years to treat hypothyroidism. Dried, powdered bovine (cow) thyroid is now also available. People can buy it over the Internet—legally if it’s sold as a food supplement, but illegally if it’s sold as a medicine. Before [synthetic](#) forms of thyroxine became available, animal thyroid saved many lives. Now patients are safer taking synthetic thyroxine. Some patients argue that pills made from animal thyroids are more “natural,” but these pills pose several dangers:

- Pills made from animal thyroid are not purified. They contain some proteins that never normally appear in the human bloodstream. Thyroxine made in a lab is exactly the same hormone that a human thyroid gland makes, but in a pure form.
- The balance of T4 to T3 in animals is not the same as in humans, so the hormones in animal thyroid pills aren’t necessarily “natural” for the human body.
- The amounts of both T4 and T3 can vary in every batch of animal thyroid, making it harder to keep blood levels right.

In sum, synthetic thyroxine is much safer than animal thyroid.

Thyroxine and weight loss

Hypothyroidism can cause a mild weight gain of 5 to 20 pounds, but does not cause obesity. People who have gained a lot of weight should find the real cause. Hypothyroid patients who are started on the right thyroxine dose won’t suddenly lose weight, but they should find it easier to lose if they try. Patients who take too high a thyroxine dose in the hope of losing weight in a hurry can weaken their muscles and bones and can get serious heart trouble—all of which makes it harder for them to exercise. Worse yet, the high dose can make them hungrier. So instead of losing weight, they may gain.

People with a normal TSH should never take thyroxine pills to help them lose weight. Taking a low thyroxine dose will not speed up their metabolism. Taking a high dose can weaken their muscles and bones, and cause serious heart trouble.

Ineffective treatments

Most hypothyroidism is permanent. Chinese herbs, selenium, iodine-tyrosine supplements, kelp (a kind of seaweed), and other herbal remedies at the health food store may promise to jump-start the thyroid, but they don’t work. Once the thyroid stops doing its job, taking extra iodine or other substances won’t help it work better. In fact, taking too much iodine can *worsen* both hypothyroidism and hyperthyroidism. Worse yet, taking false remedies can prevent patients from getting the thyroxine treatment that they really need.

Side effects and complications of treatment

The only dangers of thyroxine are caused by taking too little or too much. If you take too little, your hypothyroidism will continue. If you take too much, you'll develop the symptoms of [hyperthyroidism](#)—an overactive thyroid gland. The most common symptoms of too much thyroid hormone are fatigue but an inability to sleep, greater appetite, nervousness, shakiness, feeling hot when other people are cold, and trouble exercising because of weak muscles, shortness of breath, and a racing, skipping heart. Hyperthyroidism can also cause changes that you can't feel, like bone loss (osteoporosis) and irregular heart beat.

Patients who have hyperthyroid symptoms should have their TSH tested. If it is below normal, their thyroxine dose needs to be lowered.

People who have had thyroid cancer need to take higher-than-usual ([suppressive](#)) thyroxine doses, which increase their risk for osteoporosis. They should take in plenty of calcium through food and supplements, even though supplements can't correct the bone loss caused by too much thyroxine. These people should also be checked regularly for thinning of their bones.

Thyroxine pills do not harm the thyroid gland.

Follow-up

Repeat blood tests

You'll need to have your TSH checked about every 6 to 10 weeks after a thyroxine dose change. You may need tests more often if you're pregnant or you're taking a medicine that interferes with your body's ability to use thyroxine. The goal of treatment is to get and keep your TSH in the normal range. The American Thyroid Association recommends that your doctor try to keep your TSH within a narrow range of 0.5 to 2.0 mU/L. Within this range, your body gets the best possible amount of thyroxine and you're likely to feel the best.

Babies must get all their daily treatments and have their TSH levels checked as they grow, to prevent mental retardation and stunted growth ([cretinism](#)).

Normal variation in TSH levels

Don't worry if you get a result of 0.8 on one TSH test, and 1.1 on your next test—both of them while you're taking the same thyroxine dose. It doesn't mean that your hypothyroidism is getting worse. Differences in test results are expected:

- It's normal for your TSH levels to vary because the pituitary sends out TSH in pulses rather than a steady stream, and because TSH levels normally go up at night and come down during the day.
- Labs can't measure every test exactly the same way. If a lab runs two tests on one blood sample, they may get two slightly different results.

There is some evidence that T4 levels also normally vary a little bit through the day.

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Reasons for needing extra TSH tests

Once you've settled into a regular thyroxine dose, you can return for TSH tests only about once a year. You need to return sooner if:

- Your symptoms return or get worse. If your TSH turns out to be high, hypothyroidism is probably causing your symptoms. But if your TSH is normal, it means that your thyroxine dose has your body working right and something else is causing your symptoms.
- You want to change your thyroxine dose or brand, or change to taking your pills with or without food.
- You gain or lose a lot of weight. If you didn't weigh much to begin with, you should be tested after a gain or loss of as little as 10 pounds.
- You start or stop taking a drug that can interfere with absorbing thyroxine, or you change your dose of such a drug (see "[How your thyroxine dose is decided](#)," above). For example, if you start taking estrogen in a birth control pill or in hormone replacement therapy, you may need to raise your dose. If you stop taking the drug, you may need to lower your dose.
- You're not taking your thyroxine pill every day. Tell your doctor honestly how many pills you've missed. If you've missed pills but you say that you've been taking all of them, and if your TSH test is then high, your doctor may mistakenly think that your hypothyroidism is getting worse and may raise your thyroxine dose.
- You want to try stopping thyroxine treatment. If ever you think you're doing well enough not to need thyroxine treatment any longer, try it only under your doctor's close supervision. Rather than stopping your pills completely, you might ask your doctor to try lowering your dose. If your TSH goes up, you'll know that you need to continue treatment. You should never stop thyroxine treatment on your own. If you do, your hypothyroid symptoms will return (see "If hypothyroidism isn't treated or if treatment is stopped," below). You must take your thyroxine every day, most likely for the rest of your life.

If hypothyroidism isn't treated or if treatment is stopped

Babies and children

Thyroid hormone is essential for the brain to develop normally. Early in a healthy pregnancy, a mother supplies her [fetus](#) with thyroid hormone. During the second [trimester](#), the fetus's thyroid gland starts to make its own hormone. Once babies are born, they must depend completely on their own thyroid gland.

Too little thyroid hormone can keep the brain from developing normally. If the mother is hypothyroid, she cannot give her fetus enough thyroid hormone. When a mother with untreated or undertreated hypothyroidism bears a child who has a normal thyroid, the baby's IQ may be a few points lower than it would have been otherwise, but the child is not at higher-than-normal risk for birth defects. If a fetus is hypothyroid, it can't maintain normal thyroid hormone levels before or after birth.

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Hypothyroidism that begins before birth or up to age 3 and goes untreated puts babies at risk for mental retardation. Untreated severe hypothyroidism retards both brain development and physical growth ([cretinism](#)).

In the United States and some other developed countries, all babies are tested for hypothyroidism a few days after birth so that they can be diagnosed and begin treatment right away.

Hypothyroidism caused by iodine deficiency

The body needs iodine to make thyroid hormone. In underdeveloped parts of the world where people can't get enough iodine from their food, their body can't make enough thyroid hormone and they may be hypothyroid. This puts babies at double risk. Hypothyroid mothers can't give their fetuses enough thyroid hormone before they are born, and once the babies are born, their own thyroid can't make enough hormone. Hypothyroidism prevents the brain and body from developing normally. Worldwide, iodine deficiency is the major cause of hypothyroidism and preventable mental retardation.

Patients of all ages

No one can predict whether hypothyroidism will worsen. Subclinical (mild) hypothyroidism may never get worse, or it may progress over months or years to become moderately or very severe ([myxedema](#)). If people with autoimmune hypothyroidism also have high levels of [anti-TPO antibodies](#), their hypothyroidism is more likely to progress, although there is no way to predict how quickly. Anti-TPO antibodies attack the enzyme within the thyroid gland that helps thyroid cells make hormone.

No one knows whether treating hypothyroidism prevents it from worsening.

Severe hypothyroidism (myxedema)

The worse untreated hypothyroidism becomes, the less the body is able to cope with stressors like cold weather, infections, or even minor surgery. Severe hypothyroidism is called myxedema. Usually it takes years for hypothyroidism to reach the point of myxedema, but patients who do not have a thyroid (because of surgery or radioactive iodine treatment) can progress to myxedema in months. In patients with myxedema, the body slows to the point that it starts to shut down. At its worst, the patient falls into a coma. To survive myxedema coma, patients need good [supportive care](#) in the hospital intensive care unit. Fortunately, myxedema is now rare in developed countries because most patients are treated before their hypothyroidism becomes severe.

Keeping other people informed

Tell your family

Because thyroid disease runs in families, you should explain your hypothyroidism to your blood relatives and encourage them to get a TSH test. If it is normal, they should be retested if they develop symptoms, or at least every 5 years.

Tell your other doctors and pharmacist

Keep your other doctors and your pharmacist informed about your hypothyroidism and about the drug and dose with which it is being treated. If you start seeing a new doctor, tell the doctor that you have hypothyroidism and you need your TSH tested every year. If you see an endocrinologist, ask that copies of your reports be sent to your primary care doctor.

You don't need to wear a medical alert bracelet, but it would be wise to keep a card in your wallet that lists:

- your name and contact information
- your doctor's name and contact information
- the name of your disease
- your thyroxine brand name and dose

Partnership between patient and doctor

The more you and your doctor work as a team, the better you'll do.

Your jobs

Because you'll probably have hypothyroidism for the rest of your life, you have to be your own main caretaker. You can't depend on your doctor to do all the work for you. You have to fill your prescriptions and take your pills every day. You have to make and keep your appointments for blood tests and doctor visits. When you go for visits, you have to tell your doctor how you're feeling and be honest in saying how often you miss your pills. It's smart ahead of time to write a list of the things that you want to tell and ask the doctor.

Your doctor's jobs

Your doctor should explain your disease and its treatment, answer your questions, and listen to your concerns. The doctor should take your symptoms into account when adjusting your thyroxine dose. The doctor should give you your blood test results. The doctor should keep up to date about advances in the diagnosis and treatment of thyroid disease.

Your emotional needs

Many people get a diagnosis of hypothyroidism after years of feeling sick and believing or being told that their symptoms are “all in your head,” “just stress,” or “a normal part of aging.” Some people are so relieved finally to know what’s wrong with them that all they want is to start treatment and then get on with their lives.

Other people are so exhausted and depressed that they don’t feel that they have the physical or mental energy to work at getting better, and they may fear that they’ll never feel well again.

There are lots of problems in our lives that we can’t do anything about. This is a problem that you *can* do something about.

You just have to be patient early in your treatment for hypothyroidism—patient with yourself, patient with the confusing changes happening in your body, and patient with your doctor and the people who are going through this with you. It can take weeks to start responding to thyroxine, and it can take months (for a few patients, longer than a year) before you and your doctor get the dose exactly right. But the effort is well worthwhile. Odds are that soon you’ll be feeling better than you have in years.

Living with hypothyroidism

There is no cure for hypothyroidism, and most patients have it for life. There are exceptions: Many patients with viral thyroiditis have their thyroid function return to normal, as do some patients with thyroiditis after pregnancy. Rare patients with Hashimoto’s thyroiditis return to normal. Thyroid function may not return to normal after a person is treated with interferon alpha. Most hypothyroidism is permanent.

Hypothyroidism may become more or less severe, and your thyroxine dose may need to change over time. You have to make a lifetime commitment to treatment. You should never stop thyroxine treatment on your own. If you do, your hypothyroid symptoms will return.

If you take your pills every day and work with your doctor to get and keep your thyroxine dose right, you should be able to keep your hypothyroidism completely controlled throughout your life. Your symptoms should disappear and the serious effects of low thyroid hormone should stop getting worse and should actually improve. If you keep your hypothyroidism well-controlled, it will not shorten your life span.

Many questions about hypothyroidism remain mysteries, for example: Which genes increase people’s risk for thyroid disease? What triggers the start of thyroid disease? Why does the immune system attack the thyroid? These are among the questions that researchers, including members of the American Thyroid Association, are working hard to answer.

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Medical terms in this booklet

- Addison's disease:** permanent loss of function of the adrenal glands, which make essential steroid hormones for the body
- anemia:** too few of the red blood cells that deliver essential oxygen to the body's cells
- antibodies:** proteins that the body's immune system makes to invaders like bacteria and viruses
- anti-TPO antibodies:** in autoimmune thyroid disease, proteins that mistakenly try to attack the thyroid peroxidase (TPO) enzymes that help the thyroid gland make hormone
- autoimmune disease:** any disease in which the body's immune system, designed to protect the body from outside invaders like viruses and bacteria, mistakes a normal part of the body for an invader and tries to destroy it
- autoimmune thyroiditis:** inflammation of the thyroid, caused by autoimmune disease
- atrophic thyroiditis:** a form of autoimmune thyroiditis in which the immune system's attack on the thyroid causes it to shrink and stop making thyroid hormone
- coma:** unconsciousness from which a person cannot be awakened
- congenital hypothyroidism:** hypothyroidism in a newborn baby
- cretinism:** mental and physical retardation caused by severe congenital hypothyroidism
- deficiency:** a lack, too little
- ectopic:** in the wrong place; an ectopic thyroid gland is usually in the tongue and/or upper neck
- endocrine gland:** any gland that produces and releases hormones directly into the blood, for example, the thyroid, pituitary, adrenals, and pancreas
- endocrinologist:** a medical doctor who specializes in endocrinology, the treatment of endocrine gland diseases like thyroid disease and diabetes
- enzyme:** protein that helps chemical processes take place within the body but doesn't get used up in the process; the major enzymes in the thyroid gland are peroxidases
- feedback loop:** a system in which A affects B, which in turn affects A again
- fetus:** a developing baby inside the mother
- free T4:** the thyroid hormone T4 that circulates in the blood unattached to a protein and that can be taken up by cells in tissues
- free T4 index:** an estimate of the amount of free T4 in the blood
- gland:** an organ or tissue that makes and sends out a hormone or other substance
- goiter:** an enlarged thyroid gland, which can cause swelling in the front of the neck
- Graves' disease:** autoimmune hyperthyroidism, usually with goiter and eye symptoms
- Hashimoto's thyroiditis, Hashimoto's disease:** autoimmune thyroiditis in which the immune system's attack on the thyroid causes a goiter (swelling) and, sometimes, hypothyroidism
- hormone:** substance, made by an organ or tissue, that affects the function of one or more other organs
- hyperthyroidism:** an overactive thyroid gland
- hypothyroidism:** an underactive thyroid gland

- I 131:** one of several forms of radioactive iodine; low-dose I 131 is used for medical testing and to destroy an overactive thyroid gland
- infiltrate:** to deposit an abnormal substance in a tissue
- immune system:** the body's way of protecting itself from invaders like bacteria and viruses
- inflammation:** the body's response to injured cells
- iodine:** chemical element that is an essential ingredient of thyroid hormone
- mcg:** unit of measure, abbreviation for "micrograms"; thyroxine doses may be measured in mcg (also written as µg); 50 mcg = .05 mg (milligrams)
- metabolism:** all the processes by which the body makes and uses energy and builds tissues
- mild hypothyroidism:** subclinical hypothyroidism
- mU/L:** unit of measure, abbreviation for "milliunits per liter"; TSH levels are measured in mU/L
- myxedema:** severe hypothyroidism; the brain, heart, lungs, kidneys, and other organs slow to the point that they cannot keep up critical functions like maintaining temperature, heart rate, blood pressure, and breathing
- myxedema coma:** often-fatal unconsciousness resulting from severe hypothyroidism
- nodule:** small abnormal mass or lump; nodules in the thyroid are very common, but few are cancerous
- paresthesia:** feeling of pins and needles in the hands and feet
- pituitary ("master") gland:** from its position in the base of the brain, the pituitary monitors most basic body functions and sends out hormones that control those functions, for example, the rate at which the thyroid gland makes hormone
- polyglandular autoimmune syndromes:** combinations of autoimmune diseases affecting both endocrine and non-endocrine organs and usually involving the thyroid
- postpartum:** after giving birth
- premature ovarian failure:** before the normal age for menopause, the ovaries' loss of ability to produce estrogen and release eggs, leaving a woman unable to become pregnant
- radioactive iodine, radioiodine:** iodine that has naturally or artificially been made radioactive; see "I 131" above
- secondary hypothyroidism:** hypothyroidism caused not by damage to the thyroid gland but by damage to the pituitary gland, preventing it from being able to tell the thyroid to make hormone
- set point:** the body's preferred level or range for a function; for example, the pituitary gland knows the body's normal T4 range (set point) and works to keep the T4 within that range
- silent:** not causing symptoms
- subclinical ("mild") hypothyroidism:** a T4 in the normal range, but a slightly high TSH of 4.0 to 10.0 mU/L, causing few or no symptoms
- supportive care:** general medical care, such as nutrition and fluids, to help a patient recover when no targeted treatment can improve the person's condition
- suppressive treatment:** thyroxine dose high enough to keep the TSH below normal
- syndrome:** a combination of symptoms
- synthetic:** made in a laboratory

T3: triiodothyronine, a hormone with 3 iodine molecules, made in small amounts by the thyroid gland and in larger amounts from T4 in other body tissues

T4: thyroxine, the main hormone made by the thyroid gland, containing 4 iodine molecules

thyroid gland: an endocrine gland, normally in the lower front of the neck, that makes and sends out the hormones T4 and T3, which regulate the metabolism of every cell in the body

thyroid hormone: T4 and T3, the products of the thyroid gland

thyroiditis: inflammation of the thyroid gland

thyroidologist: a medical doctor who specializes in the diagnosis and treatment of thyroid diseases

thyroid peroxidase (TPO) enzymes: enzymes within the thyroid gland that help thyroid cells make hormone

thyroid-stimulating hormone (TSH): hormone that the pituitary gland makes and sends into the blood to tell the thyroid gland how much T4 and T3 to make

thyroxine: T4, the main hormone made by the thyroid gland; also, pills used to treat hypothyroidism by replacing the missing T4

trimester: three months; the nine months of a pregnancy are broken into three trimesters

TPO: thyroid peroxidase

TSH: thyroid-stimulating hormone

To learn more

Talk with your doctor or check the American Thyroid Association web site, www.thyroid.org. There you will find names of [thyroid specialists in your area](#), contact information for [patient support groups](#), [recommended books](#), and [information about thyroid diseases](#). These books were written by American Thyroid Association member specialists:

How Your Thyroid Works, 4th edition, by H. Jack Baskin, M.D.
Adams Press, Chicago IL, 1995

The Thyroid Gland: A Book for Thyroid Patients, 7th edition, by Joel I. Hamburger, M.D.
(published by the author), Southfield, Michigan, 1991

Could It Be My Thyroid? by Sheldon Rubinfeld, M.D.
The Thyroid Society for Education and Research, Houston, Texas, 1996

Your Thyroid : A Home Reference, 3rd edition, by Lawrence C. Wood, M.D., David S. Cooper, M.D., and E. Chester Ridgway, M.D..
Ballantine Books, New York, 1995
