Herbal Approach to Hypo-Hyper Thyroid

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Introduction to Thyroid Gland

Thyroid gland is the largest endocrine organ in human body. The weight of the gland in the adult depends on age, body weight, and iodine intake is approximately 15-25g [1].

The thyroid tissue is composed of microscopic structural units called follicles of various sizes. Each follicle resembles a small sphere surrounded by a single layer of simple glandular epithelial cells, follicular cells. These cells become columnar when stimulated by thyroid stimulating hormone (TSH) and flattened when resting [2]. The interior lumen of the follicle is filled with thick fluid called thyroid colloid. The colloid is synthesized by the thyroid epithelium of the follicle wall and contains the protein-iodine complexes known as thyroglobulins, the thyroid hormone precursors. There are numerous microvilli projecting from the follicular cell into the lumen which are involved in endocytosis and hydrolysis of thyroglobulin inside the cell to release the thyroid hormones. Scattered around the outside of the follicles are parafollicular cells, which produce a hormone calcitonin. There are two different thyroid hormones 3, 5, 3'-5'-/- tetraiodothyronine, also known as thyroxin (T4), and in lesser amount of 3, 5, 3'-/- triiodothyronine (T3) [3]. Thyroid hormones are unique in the way they utilize iodine into their structure. The tyrosine residues in thyroglobulin are iodinated to form mono- or diiodotyrosine, which are combined to form T3 and T4. One molecule of T4 contains four iodine atoms, and one molecule of T3 contains three iodine atoms. Plasma levels of T4 and T3 are 0,4% and 0,04% respectively [2].

Thyroid hormones are essential for promotion of growth and development, especially in children, and maintenance of body's homeostasis by regulation of energy production and heat generation. Thyroid gland is unique in the way it stores the considerable amounts the synthesized hormones before secreting them, none of the other endocrine glands store their hormones in another form for later release. When they are to be released, T3 and T4 detach from the thyroglobulin and enter the blood stream. In the blood, however, they are transported by plasma proteins and circulate as a hormone-globulin complex. Although the thyroid gland produces more T4 than T3, T3 has higher affinity to the thyroid hormone receptor. Thus, the small amount of T4 that enters target
tissues is usually converted to T3 which is considered a principal thyroid hormone. Thyroid hormones helps regulate the metabolic rate of all cells, as well as the processes of cell growth and tissue differentiation.

There are several control mechanisms of the thyroid function. The classic hypothalamic-pituitary-thyroid axis is the primary control mechanism in which the pituitary synthesis and release of thyroid-stimulating hormone (TSH) is stimulated by the release of thyrotropin-releasing hormone (TRH) from the hypothalamus, TSH in turn stimulates growth and hormone secretion of the thyroid gland. Secondary mechanisms of thyroid function control include: “up-regulation” and “down-regulation” of pituitary and peripheral deiodinase expression, to modify the effects of T4 and T3; or thyroid gland auto-regulation in response to iodine availability.

**Hypothyroidism**

Hypothyroidism is defined as inadequate peripheral tissues stimulation by the thyroid hormone. This deficiency is caused by either failure in adequate thyroid hormone production or reduction in tissue sensitivity to the thyroid hormone stimulation. The decreased thyroidal secretion of thyroid hormone, due to the factors affecting the thyroid gland itself is called “primary” hypothyroidism; decrease in serum concentrations of thyroid hormone caused by an inadequate TSH secretion, due to factors directly affecting the anterior pituitary gland is called “secondary” hypothyroidism; the failure of TRH release, due to the factors affecting hypothalamus, will cause an indirect decrease in the secretion of thyroid hormones called “tertiary” hypothyroidism. The secondary and tertiary hypothyroidism is often referred to as “central hypothyroidism.”

Hypothyroidism with onset in adulthood causes a generalized slowing down of the organism, with deposition of glycosaminoglycans in intracellular spaces, particularly in skin and muscle, producing the clinical picture of myxedema. Hypothyroidism is graded on a scale ranging from Grade 1—mild cases in which the individual hardly notices signs and symptoms thyroid hormone deficiency, to Grade 3—severe cases in which severe unregulated thyroid insufficiency may cause myxedema coma and death. Most symptoms of hypothyroidism in adults are largely reversible with therapy.

**Traditional Chinese Medicine Approach to Hypothyroidism**

Traditional Chinese medicine has for several thousand years been the treatment of choice for over a quarter of the world’s population for its ailments, infections, and other health problems. Today, Traditional Chinese Medicine (TCM) is practiced in China alongside with Conventional Western Medicine. Most hospitals include departments of complementary medicine which offer acupuncture treatment and herbal medicine. The acupuncture in United States is most often associated with pain management and builds on a ‘conventional’ interpretation of how the body functions.

Traditional Chinese medicine is every bit as logical and systematic as Conventional Western medicine and is based on a different understanding of reality. TCM has for
centuries made use of the same basic concepts like Qi and the balance of Yang and Yin to explain various universal phenomena.

Although it is difficult to guess when humans first started using herbs as medicine; the Traditional Chinese Medicine, as a form of medicine practice today, dates 4000–6000 years back in time. While acupuncture is the best known modality of TCM in the West, this medicine is by no means is just limited to acupuncture. Chinese medicine makes great use other therapeutic modalities like herbal remedies, acupuncture, auricular acupuncture, cupping, Tui Na; as well as Tai Ji and Qigong as forms of physical therapy.

**Differences between TCM and Conventional Western Medicine**

In Conventional Western schools of medicine body is studied as a sum of its parts, and every organ system of the body is judged and treated separately. Hospitals are specialized by different departments associated with the diagnoses and treatment of different organ systems: one for the cardiovascular patients; another for the endocrinology; yet another for surgery. Traditional Chinese Medicine is holistic, where the body is treated as a ‘whole,’ and every part of the body is seen as a reflection of the wider context. A particular body part is referred to only in relation to the whole body, and the body must also be seen as intimately connected with the spirit and the surrounding environment in which the patient lives before a doctor of TCM can understand how an illness has arisen and how it should be addressed.

**Thyroid Deficiency in TCM**

Thyroid disorders are some of the most common clinically encountered endocrine disorders worldwide. Until the resent discovery of the more accurate understanding of the thyroid anatomy and its role in human physiology as a major endocrine organ, as well as the introduction of new imaging techniques and serum thyroid function tests into the modern medical practice; the ancient physicians were limited to few general symptoms and basic physical evaluation to diagnose disorders related to the thyroid gland. The diagnosis in the Traditional Chinese Medicine (TCM) pattern was limited to detection of common signs and symptoms often seen in hypothyroidism and palpation of neck nodules in the area of the thyroid gland. In modern TCM practice objective measurements, such as thyroid hormone levels, TSH values and the presence of autoreactive immunoglobulins, can clarify the nature of the disease and give a clue to a various herbal therapeutic approaches that might be effectively applied in the treatment of hypothyroidism. Even though, the clinical management of hyperthyroidism cases has been of a greater interest in the Traditional Chinese Medicine field, the hypothyroidism is no less prevalent in the modern day TCM practice. The treatments may vary from one physician to the next, but there are certain consistent features which will be discussed mainly in regards to management of patients with hypothyroidism. The clinical manifestations of hypothyroidism are associated with consumptive deficiency, edema, goiter and other signs and symptoms according to the TCM differentiations and pathogenesis.

**Etiology and Pathogenesis**
The hypothyroidism, as described in Traditional Chinese Medicine texts, is classified mainly as the deficiency disorder. The diagnosis must be differentiated and often varies from case to case depending on the individual patient’s clinical presentation. It is important to understand that hypothyroidism is the condition arising due to the chronic deficiency of one or more vital substances of the body: Qi, Blood, Yang, Yin and Essence. This is a systemic disorder which may start with general Qi deficiency and affect all organ systems over the long period of disease progression. The Spleen, Kidney and Heart are three primary organs involved in the pathogenesis of hypothyroidism. The Lung and Liver are also affected in an indirect manner. Manifestations of various deficiencies are diverse and can affect a wide variety of physiological processes. The precipitating causes of hypothyroidism include constitutional factors, diet, overexertion, emotional stress, trauma, chronic debilitating illness, as well as the side effects of medical treatment. Patterns of deficiency will be differentiated by aspect of underlying deficiency of Yin, Yang, Qi or Blood in regards to the deficient organ, or a combination of organs, involved in pathogenesis: Spleen, Kidneys, and Heart.

The clinical manifestations of the hypothyroidism emerge gradually as the result of slowing metabolism and depletion of body’s Qi which develops into the Yang deficiency. As the Yang qi deficiency becomes more severe it begins to fail in its functions of warming, motivation, and transformation, resulting in the decline of multiple organ functions and classical set of symptoms often seen in patients with clinical hypothyroidism. The initial stage of the disease is equivalent to the subclinical hypothyroidism, and marked mainly by the Spleen Qi deficiency and is often associated with its symptoms. As the disease remains untreated the Ming men fire begins to fail to compensate the Spleen Yang deficiency. As the result more, Kidney Yang deficiency symptoms arise and the Spleen Yang deficiency symptoms worsen, marking the stage of clinical hypothyroidism. Thus, Yang deficient Kidney will fail to warm the Spleen Yang Qi, resulting in severe Yang depletion in both organs. When Spleen Qi is deficient the generation of the Source Qi and Blood is inadequate, resulting in Kidney Essence depletion. It may be years before the Kidney Ming men fire begins to fail to warm the Heart Yang, which will lead to Heart Yang deficiency. Untreated Yang deficiency will result in the failure of fluids metabolism and will cause in the excess water to overflow towards the Heart and lead to cardiac dysfunction and associated symptoms commonly seen in patients with advanced stage of overt hypothyroidism. Even though, it is extremely rare to encounter patients with severe hypothyroidism in the developed countries due to proper diet, improved screening, timely diagnosis and treatment of the disease, the hypothyroid patients who remain untreated may have about ten to fifteen years before their basic body functions will start failing.1 Thus, the severe Yang deficiency will inevitably result in the complete depletion and devastation of the Ming men fire which will manifest as a number of life threatening functional failures. Note that the Kidney Yang and Ming men fire refers to the fire at the gate of vitality and will be used interchangeably in this report.

Factors Contributing To the Disease

Common contributing factors of the thyroid deficiency include: improper diet, iatrogenic and constitutional factors and overexertion.

Improper diet
Irregular dietary intake, excessive consumptions of raw and cold foods, like bok choy, will injure Spleen Yang Qi [4]. Chronic iodine and selenium deficiency will also contribute to the rise of hypothyroid state, previously believed to be the ‘evil Qi’ and sand in the water of springs and rivers, especially in the mountainous regions.

**Iatrogenic factors**

Long term use or unusually high doses of bitter and cold herbs, emetics, and purgatives, have direct impact on Spleen and Stomach Yang Qi, and may impair their functions of transportation and transformation of food and fluids.

**Constitutional factors**

Constitutional factors include congenital deficiency and prenatal malnourishment, both of which may play role in development of thyroid deficiency. In Women the depletion of Essence and Blood from repeated births will directly drain the Kidney, Liver and Spleen.

**Overexertion**

Overtaxation and exhaustion of Kidney Yang by physical, mental or sexual activities is also one of contributing factors of hypothyroidism. It is apparent that hypothyroidism is the result of both Qi and Blood deficiency which gradually develops into the Yang and eventually Yin deficiency.

**Clinical Picture**

Hypothyroidism, like most other endocrine disorders, develops gradually over the period of several years and even decades. Many symptoms can erroneously be attributed to general environmental factors and natural aging. Patients often seek medical help when the symptoms begin to interfere with their daily activities.

As the disease progresses the symptoms will worsen and more severe symptoms may manifest. Even though, the symptoms of hypothyroidism come in a great variety they all arise from the core pathogenesis of the deficiency in Yang Qi that is failing to warm, defend, consolidate and transform.

**Fatigue and weakness**

This is the earliest of symptoms of subclinical hypothyroidism while the thyroid deficiency may not be apparent. It is very difficult to diagnose the subclinical hypothyroidism this early without the serum TSH analysis, and even then the western physician will often postpone the treatment until more severe symptoms appear. In TCM fatigue and weakness, especially on exertion, is associated with general Qi deficiency and suggests the involvement of Spleen in early pathogenesis of the disease. The ‘leg Qi’ and atrophy disorder may arise as the result of either dampness or chronic Spleen deficiency. This pattern is discussed in the Essential Questions which says “With exposure to dampness over a period of time, the muscles and flesh will be invaded; this will lead to insensitivity and flesh atrophy” and “When there is illness in the Spleen it fails to transport body fluids for the Stomach. The four limbs do not receive the
nourishment of water and grain and therefore become weak. There is no free flow through the vessel-pathways and there is no qi to engender the sinews, bones and muscles which therefore cannot function [5]. Thus, Spleen Qi deficiency will also lead to development of such symptoms as decreased appetite, muscle weakness, delayed reflex time, anorexia, distention and bloating especially in the latter stage of the disease. Chronic Spleen deficiency will cause blood deficiency and anemia, and also result in Qi stagnation leading to muscle spasms, cramps, myalgia and even ataxia.

**Cold intolerance**

It is the most definitive symptom of the thyroid deficiency. Qi is yang and possesses a warming quality. Qi maintains and regulates the body temperature. Aversion to cold is classically associated with the deficiency in Yang qi, which fails to adequately warm the body. This symptom may often be missed in the early stages of the disease because the patient usually starts by compensating behavior: avoiding the cold by dressing warmer and increasing the room temperature. As the body’s Yang qi weakens the internal cold starts accumulating, this phenomenon is also known as Yang deficiency generating internal cold, which may lead to slowing or even freezing of physiological processes. Sweat is generated via the transformation of fluids by the Spleen and Kidney Yang qi. The deficiency in Yang qi consequently results in hypohidrosis (partial lack of sweating) and consequently myxedema (internal fluid accumulation) due to the failure of Qi to open the pores and regulate the fluid metabolism or cold pathogen closing the pores shut. Usually patients will complain of the general Qi deficiency symptoms like pallor, fatigue, lethargy and muscle weakness, edema, deficient constipation and indigestion, depression, impaired memory and slow speech. Tongue and pulse will reflect the underlying Qi deficiency and is often pale, swollen with teethmarks, with thin slippery coating. The pulse will be deep, forceless, and slow but regular, suggesting Yang deficient cold.

It is important to differentiate the aversion to cold and the lack of sweat in hypothyroidism to Wind-Cold invasion. Wind-Cold is an external pathogen invading the body and resulting in an ‘excess’ condition which will not be alleviated by warm blanket or more clothes.

**Constipation**

Constipation is another major symptom of hypothyroidism. Diminishing Yang will eventually result in internal deficient cold accumulation in the Large intestine causing reduced bowel motility and obstruction. Other gastrointestinal symptoms may include cold epigastric or abdominal pain and spasms, which are relieved by warmth and pressure, as well as poor appetite and indigestion, accompanied by deep slow pulse.

**Edema**

Kidney stores Ming men fire, which helps to metabolize fluids. In hypothyroidism, when Kidney Yang is deficient, the water circulation in the body is disrupted, leading to pathogenic derivatives that are cold and Yin in nature, resulting in systemic edema. The edema is non-pitting and is often seen on the face, the skin may be thick and difficult to pinch. The later stage of hypothyroidism is marked by peritibial edema.
which may be pitting. Fluids may also accumulate in the joints, causing swelling and joint pain and even carpal tunnel syndrome. As the disease advances towards the later stage, water often overflows the heart and the lung resulting in the pericardial and pleural effusions. Consequently, angina, chest congestions, palpitations, slow pulse and slow breathing, dyspnea are common in myxedematous patients; as well as the pleural effusions resulting in chronic respiratory infections and eventually leading to myxedema crisis and coma. In TCM, myxedema coma is also perceived as accumulation of turbid, cold, Yin pathogens in the pericardium [6].

**Dry and flaky skin, thinning of hair or loss of hair**

Spleen and Kidney Yang deficiency result in Blood and Essence depletion. Spleen Yang qi is responsible for generating Qi, Blood, and Essence. The deficiency in Spleen Yang qi in hypothyroidism results in the failure of the Spleen to distribute nutrients to the body, resulting in Blood and Qi deficiency causing dry and flaky skin. The kidney manifests in the hair, thus as the Kidney Yang and Essence is depleted the hair becomes dull, thin, and more scares.

**Irregular menstruation and menorrhagia**

Hypothyroidism is much more common in women than men, and often disturbs women’s menstruation. Qi is one manifestation of Essence. The patency of Liver Qi is important to help Spleen Qi function well. Severe Qi and Blood deficiency in hypothyroid women often disrupts the circulation of Liver Qi and Chong Mai which are responsible for smooth menstrual cycles and release of the menstrual blood, and results in menses which are often irregular and sometimes anovulatory, causing infertility. Pale menorrhagia is also common. In hypothyroid men chronic Kidney Yang Qi and consequent Essence deficiency may manifest as impotence and infertility.

**Other signs and symptoms**

Many patient with the progressive hypothyroidism present with Heart and Kidney deficiency leading to Shen disturbance manifesting as depression, reduced attention span, memory deficit, slowed reaction, husky voice and vertigo.

**Differential Diagnosis**

The first step in diagnosis of hypothyroid condition according to TCM is to determine the nature of deficiency in the patient's energy field that gives rise to the presented signs and symptoms. Second step is to differentiate, the suspected diagnosis to create the most efficient treatment plan. The disorder may then be treated with herbs and acupuncture, or even cupping, Tai Ji, Qi Gong or Tui Na if so desired. An experienced physician will seek a ‘pattern in the fabric’ of the condition and choose a treatment that favorably influences that pattern. One may begin by asking the patient about the symptoms, checking the signs, including pulse and tongue diagnosis. For example there may be detailed questions on possible perspiration, feelings of warmth or cold, on the patient’s bowel movement and digestion, evacuation of urine, and in the case of female patients, fertility and menstruation, even if the patient’s illness might be seen and having no connection with such matters. The key is to find a pattern in the balance
between Yin and Yang and of the flow of Qi in the body, using the information gathered in order to gain an understanding of how the various organs are working together, and what went wrong. An experienced physician, may also perform an examination of the ear, by visual inspection and palpation; and any changes in color, shape and possibly sore points or points with a changed electrical resistance will be noted.

**Major TCM Patterns of Hypothyroidism**

**Spleen Qi Deficiency**

The early stage of subclinical hypothyroidism is associated with Spleen Qi deficiency, which if untreated will develop into more serious Spleen Yang deficiency, which will further affect the function of all remaining organs. General symptoms of Qi deficiency include lethargy and fatigue, which are precipitated by physical activity and improve with rest, which are key symptoms associated with subclinical hypothyroidism. Other common symptoms of Spleen Qi deficiency are shortness of breath (on exertion), concise, slow and occasionally slurred speech, husky voice, dusky complexion, reduced appetite, loose stools, and a weak pulse.

a. **Herbal treatment:** Si Jun Zi Tang or ‘Four-Gentleman decoction’ formula is recommended in the treatment of subliminally hypothyroid patients with Spleen Qi deficiency. This formula tonifies the Spleen, augments the Qi and raises and lifts the clear Yang Qi, promoting the circulation in the Middle jiao, and lifts the sunken.

**Spleen Yang deficiency**

Since, the Spleen and Stomach control the transformation and transportation of food and nutrients they play an essential role in regulating the ascension and discretion of the Qi. In clinical hypothyroidism, when the Yang Qi of the Middle jiao is weak, the patient may suffer an invasion of external cold, which may hinder the normal Qi flow and result in epigastric and abdominal distention or even pain. Spleen Yang deficiency is characterized by intolerance and aversion to cold, cold extremities, poor appetite, pallor, fatigue (cold type), epigastric and abdominal cold pain relieved by warmth and pressure, constipation, distention and excessive thin white leucorrhea in women. The tongue is usually flabby and pale with teethmarks and with white and slippery coating. The pulse is deep, slow and forceless or faint in severe thyroid deficiency.

**Herbal treatment:** The treatment principle for the Middle jiao Yang deficiency would be to warm the Yang, disperse cold, augment the Qi and to strengthen the Spleen. Thus, most herbs used to treat this condition are warming and acrid, and somewhat dry in nature. Gan Jiang (zingiberis rz) is one of such herbs used in the treatment of most patterns of hypothyroidism. Other frequently used herbs are Fu Zi (aconiti rx lateralis) and Rou Gui (cinnamomi cortex), which can be combined with herbs that strengthen the Spleen and augment the Qi, like Huang Qi (astragali rx), Ren Shen (ginseng rx), and Bai Zhu (attractylodis macrocephalae rz) [7].

**Qi and blood deficiency**
It is said that the ‘Qi is the commander of Blood, and Blood is the mother of Qi [8]. Qi and Blood are mutually connected, 'when Qi moves the Blood follows,' Blood in turn nourishes the Qi, and thus tonifying one will have the indirect effect on the other. Low Red Blood cell count and hypoxia are clinical manifestations of chronic hypothyroidism associated with Qi and Blood deficiency which is marked by fatigue, weakness, slowness, palpitations, sallow complexion, amenorrhea, pale tongue and choppy pulse.

Menorrhagia is a common presentation of clinical hypothyroidism, occasionally accompanied with recurrent pain, or restless fetus disorder. From the Traditional Chinese medicine perspective the pathogenesis is associated mainly with the complex of functional system of the Liver, Chong Mai, and Uterus, known as the ‘sea of Blood [8]. If the Liver Blood is deficient, it is unable to rise and nourish the head, resulting in dizziness, vertigo, and impaired vision. When the Sea of Blood is empty the menstrual cycle is typically irregular with a scanty flow; however, 'when the Blood becomes disordered, menorrhagia may also occur [9]. The tongue is usually pale and pulse is thin and wiry; choppy pulse may be felt in the condition of Blood stasis.

**Herbal treatment**

Use modified Shi Quan Da Bu Tang (All-Inclusive Great Tonifying Decoction) to warm and tonify Qi and Yang and stimulate the production and transformation of Blood.

**Spleen and kidney yang deficiency**

The difference between the deficient cold and external excess cold is that; cold due to Yang deficiency, may be alleviated by simply wearing more clothing, where as cold sensation and chills associated with an exterior pathogen cannot, even by increasing the room temperature. The symptoms like lassitude, lethargy and withdrawal into oneself, aversion to cold, cold extremities, soreness and weakness of the lower back and knees, a flabby pale tongue with white moist coating, and deep slow and forceless pulse (especially at the right proximal position) seen in severe clinical hypothyroidism are some of the common manifestations of Spleen and Kidney Yang deficiency.

**Herbal treatment**

You Gui Wan can be used to treat this Yang deficiency pattern of progressive clinical hypothyroidism, and its primarily focus is tonification of the Kidney Yang, because the Kidneys’ Ming men fire is the source Yang at the gate of vitality.

**Heart and kidney yang deficiency**

Kidney is the root of the body's Yang Qi, which supports the generative and transforming processes of all other organs, chronic Kidney Yang deficiency will result in Spleen Yang deficiency. Water and dampness accumulation, in the late stages of hypothyroidism, will impair the Yang Qi from ascending the clear and descending the turbid, which may obstruct the sensory orifices. Thus, overtly hypothyroid patients often complain of impaired hearing, heavy sensation in the head, dizziness ranging from lightheadedness and positional vertigo to severe dizziness even when lying down. The
patient also feels weakness and instability in posture which sometimes requires a conscious effort to maintain.

When pathogenic water ascends and overflows the Heart, it causes palpitations and when it overflows the Lungs and disrupts the Qi, it causes cough and dyspnea. Clinical manifestation of Heart and Kidney Yang deficiency are marked by palpitations, chest congestion, angina, lassitude, lethargy, aversion to cold, cold extremities, absence of sweating, soreness and weakness of the lower back and knees, hoarse voice, slow response to stimuli, and severe systemic myxedema. The pale or dark swollen or flabby tongue with tooth marks, the white, slippery tongue coating, and the deep, slow, thin, forceless, irregular pulse are signs of Yang deficiency with internal retention of pathogenic water and dampness.

**Herbal treatment**

A variation of Zhi Gan Cao Tang (Prepared Licorice Decoction) in combination with Zhen Wu Tang (True Warrior Decoction) can be used to warm and unblock the flow of the Heart Yang, warm the Kidney and promote urination in overtly hypothyroid patients.

**Depletion and devastation of yang**

If the condition of debilitated Yang and exuberant Yin with cold in the interior is left untreated, it will eventually lead to Yin repelling Yang, and result in ‘floating Yang’ syndrome. This pattern of devastated Yang Qi due to its chronic depletion is associated with myxedema crisis, cold inversion pattern, and characterized by pale and dusky complexion, dizziness and blurred vision, icy-cold extremities, shallow and weak respiration, flaccid and weak muscles, somnolence, or even myxedema coma; dusky pale tongue and minute almost imperceptible pulse. In severe cases the Yang will float and the patient may break into a strong profuse sweat.

**Herbal treatment**

Use Si Ni Jia Ren Shen Tang (Frigid Extremities Decoction with Ginseng) to warm and rescues the devastated Yang from collapse, reverse peripheral frigidity, and to warm the Middle jiao to transform turbidity.

**Treatment of Hypothyroidism with Acupuncture & Moxibustion**

Hypothyroid patients are often deficient in Yang and Qi, long needle retention or strong acupuncture stimulation may drain Qi, tonification techniques are highly advised and the use moxibustion is encouraged where applicable. It is also important to keep in mind, that as a general rule, Back-shu points tonify the Zang organs and regulate the Fu organs, while Front-mu points sedate the Fu and regulate the Zang.

Dan Xi Xin Fa (Dan -xi’s Heart Methods) recommends: “For great disease due to vacuity desertion which is Yin vacuity, use Ai Ye (artemisiae argyi folium) moxa at the Dan Tian
(Ren 6-4) in order to supplement Yang. When Yang grows, Yin is lengthened [also grows] [10].

**Treatment Protocols**

The key points for the treatment of signs symptoms and the root cause of clinical hypothyroidism will be discussed in a great detail in this section. The summary of these points is presented in Table 1.

<table>
<thead>
<tr>
<th>Du4 (Ming Men)</th>
<th>Ren4 (Guan Yuan)</th>
<th>Ren6 (Qi Hai)</th>
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<tr>
<td>St36* (Zu San Li)</td>
<td>UB17 (Ge Shu)</td>
<td>Li4* (He Gu)</td>
</tr>
<tr>
<td>Sp6* (San Yin Jiao)</td>
<td>UB23 (Shen Shu)</td>
<td>P6 (Nei Guan)</td>
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**Table 1:** Nine key points for treatment of hypothyroidism. (*) – Points from the song of ‘Nine Needles which Revive the Yang.’

Several treatment plans are presented below. The plans are similar in construction, and can be used independently, depending on which modality a practitioner prefers, or which therapy the patient would best tolerate.

**Supplementary Points for Various Patterns**

For Spleen Qi Deficiency and Spleen Yang Deficiency (Subclinical and Clinical Hypothyroidism) add Ren12 (Zhong Wan).

In Qi and Blood Deficiency (Chronic Clinical Hypothyroidism with cognitive and psychoemotional deficiencies) add Du20 (Bai Hui) [11].

For Spleen and Kidney Yang Deficiency (Chronic Clinical Hypothyroidism) with stifling sensation chest and speech impairment add Ren12 (Zhong Wan) and Ren17 (Shan Zhong).

In Heart and Kidney Yang Deficiency (Overt Hypothyroidism) use Ren17 (Shan Zhong) in addition to a ‘Guest-Host’ combination of Sp3 (Tai Bai)-Yuan-host and St40 (Feng Long)-Luo-guest to resolve Phlegm due to Spleen deficiency to treat pleural and pericardial effusions, coronary artery disease due to hyperlipidemia and Qi-Phlegm goiter.

In Depletion and Devastation or Collapse of Yang Qi (Myxedema Crisis) add Du20 (Bai Hui) with Ren17 (Shan Zhong).

For Abandonment Disorder (Myxedema Coma) add Du20 (Bai Hui) and needle Du26 (Ren Zhong), to resuscitate the patient from acute syncope. Most hypothyroid patients became comatose when their respiration fails, thus it is important to keep patient conscious until the paramedics arrive.

**Auricular Acupuncture**
Few of the points that can be added to acupuncture treatment protocols for hypothyroid patterns:

General points for hypothyroidism use ‘Endocrine’, ‘Thyroid’, ‘Neurogate’, ‘Subcortex.’

**Conclusion and Review**

It is clear, that the thyroid is one of the most important endocrine glands that produce hormones to regulate metabolism of the whole body including: brain, respiration, cardiovascular and nervous system functions, body temperature, muscle strength, skin dryness, menstrual cycles, weight, energy and water metabolism.

Despite great progress made in medical technologies, all practitioners should strive to make physical and psychological contact with patients, to acquire more complete understanding of functional disorders, without relying on conventional techniques along. This diagnostic approach, however, requires the sufficient medical knowledge to interpret and experience to correlate such information.

According to records of accumulated knowledge generated by the sages of Traditional Chinese Medicine over several millennia, through close observation and experience of treatment of patterns closely associated with hypothyroidism, it is understood that this is a condition of true deficiency in Yang Qi of the body. The etiology of hypothyroidism is rooted in improper diet, overexertion, or environmental factors. Several patterns were discussed to reflect the pathogenesis of the thyroid deficiency and explain the mechanism of the progression of the disease from Spleen Qi deficiency, to development of Spleen, Kidney and eventually Heart Yang deficiency, and further involvement of the Lungs and Liver, and eventually exhaustion and collapse of Yang, finally resulting in coma as the condition continues to worsen.

In general, the Traditional Chinese Medicine management of overtly hypothyroid patients in the modern practice will often be complimentary to standard Conventional Western hormone replacement therapy. When treating a hypothyroid patient, it is important to always address the root cause of the thyroid deficiency. The herbal and acupuncture therapy can often be used in conjunction with the hormone replacement therapy to achieve greater results and to subdue the adverse effects of levothyroxine. It is essential to remember, however, that all herbal preparations, including tonifying formulas have very specific indications and associated effects, and should never be used thoughtlessly.

The practitioner must be able to most efficiently help to promote functional balance and revitalize the patient.

Exercise and proper nutrition are also helpful modalities to support the treatment of hyperthyroidism. As always, it is important to always provide a patient, caring treatment, and to offer behavioral recommendations about lifestyle factors that may benefit the patients or consume essence and aggravate the deficiency in the body.

The thyroid tissue, even after a partial thyroidectomy, iodine irradiation, autoimmune or inflammatory destruction has a potential to revive and resume the production of
adequate amounts of thyroid hormones. Human body poses mechanisms of self-restoration, and a caring physician should attempt to help the patient by restoring the thyroid glands function, to help the patient live a complete life full of vitality.

References


Herbs for Potential Adjunct Treatment of Thyroid Disease A Review of Botanical Preparations for Hypo- and Hyperthyroidism, Thyroid Nodules, and Thyroid Cancer

Katie Welch

By Katie Welch, Pharm D

Summary

Diseases of the thyroid are varied and can take many forms, which may or may not produce clinical symptoms that alert patients to their existence. The most common thyroid disorders are the under- or over-functioning of the gland—hypothyroidism and hyperthyroidism, respectively. Both of these most often result from autoimmune disorders. Physical irregularities, often termed nodules, occurring on the thyroid are a distinct condition of the gland and may arise simultaneously with these diseases, or emerge idio pathically with no symptoms. An important minority of thyroid nodules are malignant. Botanical medicines to treat thyroid disease are limited and have not been widely studied in humans. Traditional Western herbal medicine lacks a body of herbs earmarked for thyroid health, but modern research on a few of these herbs reveals potential clinical applications toward hyperthyroidism in humans. There are no herbs indicated in the Western tradition for resolving thyroid nodules per se, and herbs to treat thyroid cancer are not distinct from other herbs used in this tradition for
Chinese medicine, on the other hand, has several herbs and herbal formulas earmarked for the resolution of thyroid disease and thyroid nodules, which may be interpreted (depending on symptoms) in the context of traditional Chinese medicine (TCM) as a disturbance of *qi*, a condition of excess or insufficient *yin*, or an accumulation of stagnant “phlegm” or “blood.” These herbs have also largely been studied individually only *in vitro* and in animals, but some clinical trial data are available on TCM herbal formulas for treating hyperthyroidism. Much of this data has been the subject of a recent systematic review. Both the TCM and Western modalities may employ the use of seaweed and sea products in thyroid formulas; these must be used with extreme caution due to the varying and often unpredictable effects of iodine supplementation on thyroid function.

Search Strategy

Secondary and tertiary sources of herbal medicine information in the American Botanical Council library and literature database were searched for basic information on herbs for thyroid disorders in the Western and Asian herbal medicine traditions. A list of plants with suspected thyroid activity was gathered, and their Latin binomials entered into the search engine of PubMed, a service of the US National Library of Medicine that includes over 16 million citations from MEDLINE and other life science journals for biomedical articles dating from the 1950s. Relevant articles were accessed and searched for information pertaining to thyroid. Latin binomials of plants with suspected thyroid activity were also entered into the search engine of NAPRALERT, a natural products database at the University of Illinois at Chicago encompassing over 200,000 scientific papers and reviews regarding organisms from all over the world, dating from 1975 through 2003. In addition, NAPRALERT was searched for plants with pharmacological activity using the search terms “antithyroid effect;” “antithyroid activity;” “thyroid hormone receptor antagonist;” “thyroid peroxidase inhibition;” and “thyroid type 1 deiodinase inhibition.” Articles describing studies in humans were accessed and searched for information pertaining to thyroid.

Physiological Function of the Thyroid Gland

The thyroid is a two-lobed gland in the anterior neck composed of microscopic follicles that sits below the thyroid cartilage (“Adam’s apple”). The surface-layer cells (epithelium) of the thyroid’s follicles perform the processes of synthesis and release of thyroid hormones. The two main thyroid hormones are thyroxine (T4) and triiodothyronine (T3). Once released into the blood plasma, T4 and T3 bind reversibly to plasma proteins. Most circulating thyroid hormones are protein bound, yet only the free (unbound) fraction is available to tissues, whose cells actively take up the hormone molecules.

Thyroid hormones bind to a specific receptor located in the nucleus of most cells. Activation of this receptor affects many cellular functions, primarily cell growth and metabolism by direct influence on gene transcription and subsequent protein synthesis, or by direct effects on the cell or on mitochondria through stimulation of cell growth and respiration. Thyroid hormone is regulated by the hypothalamic-pituitary-thyroid axis via a negative feedback mechanism. Thyrotropin-releasing hormone (TRH), synthesized in the hypothalamus, stimulates the pituitary gland, which manufactures thyrotropin, also known as thyroid-stimulating hormone (TSH).
TSH travels to the thyroid gland to stimulate synthesis and release of T4 and T3. A decrease in plasma T4 or T3 triggers an increase in plasma TSH, and vice-versa.\(^1\)

The thyroid also contains another type of cell: parafollicular cells, known as “C cells,” which synthesize and release the hormone calcitonin. Calcitonin lowers plasma calcium levels.\(^3\)

**Thyroid Diseases: Classification and Diagnosis**

The typical thyroid diseases discussed in this article are hypothyroidism, hyperthyroidism, thyroid nodular disease, and thyroid cancer. Classification and diagnosis of thyroid disease involves several steps. These include evaluating a patient for the following\(^3\): (1) presence of clinical symptoms (e.g., weakness, cold intolerance, headache, slow speech); (2) physical findings (e.g., thinning of hair and nails, tachycardia, bradycardia, peripheral edema, weight loss or gain); (3) blood chemistry (levels of circulating thyroid hormone, TSH, thyroid antibodies); and (4) presence of visible or palpable irregularities upon the thyroid gland itself (which require evaluation with biopsy and/or ultrasound to rule out thyroid cancer).

**Hypothyroidism**

This is defined as a clinical syndrome resulting from a deficiency of thyroid hormone. Clinical symptoms generally include cold intolerance, lethargy, weight gain, and muscle aches. Physical findings may include bradycardia; thinning of hair, skin, and nails; thickening of tongue; puffiness of face, eyelids, or peripheral edema; pallor. Hashimoto’s disease is the most common cause of spontaneous hypothyroidism.

**Hashimoto’s Disease:** In this disease, antibodies attack thyroid tissue and impair production/release of thyroid hormone, leading to a hypothyroid condition, or sometimes a diffuse swelling or enlargement of the gland (goiter) with or without hormone deficiency. Physical irregularities of the thyroid gland that arise with Hashimoto’s disease are usually multiple, presenting as a so-called “multinodular goiter”; minimal increased risk of thyroid cancer is linked to this disease, though thyroid cancer (including thyroid lymphoma) must be ruled out.\(^4\)

**Hyperthyroidism**

This is defined as a clinical syndrome resulting from an excess of thyroid hormone. Clinical symptoms generally include heat intolerance, irritability, insomnia, and fatigue. Physical findings may include hair loss, palpitations, ophthalmopathy, tremor, and diarrhea.\(^1\) Graves’ disease is the most common cause of hyperthyroidism.

**Graves’ Disease:** In this disease, antibodies stimulate thyroid tissue and cause it to overproduce/release too much thyroid hormone. Multinodular goiter is less common with Graves’ disease than with Hashimoto’s disease; in Graves’ disease, a diffuse, non-nodular swelling of the entire gland usually occurs instead. There is an increased risk of thyroid cancer with Graves’ disease.\(^4\)

**Subacute Thyroiditis:** This refers to a diffuse swelling of the thyroid gland, which occurs as an acute inflammatory reaction typically following several types of viral infection. In most cases the thyroid is large and very tender. Some instances of subacute thyroiditis are marked by a transient hyperthyroidism. This disease is typically self-limited, and both thyroid inflammation and transient hyperthyroidism
resolve within a few months without lasting clinical symptoms.\textsuperscript{3} A hypothyroid phase may also follow the hyperthyroidism.

**Thyroid Nodules**

Physical irregularities of the thyroid gland not associated with abnormal antibody production may emerge as diffuse, singular, or multiple entities, and be either functional or non-functional parts of the gland. These physical irregularities are sometimes referred to as “nodular” or “multinodular,” and they do not necessarily emerge because of one particular insult to the gland or disease; rather, they may manifest due to a variety of thyroid disorders and may or may not cause other clinically detectable symptoms. In countries where iodine deficiency has been corrected, physical irregularities of the thyroid gland are clinically detectable in about 4 to 7% of the population.\textsuperscript{5}

**Nontoxic Goiter:** This refers to thyroid enlargement or physical irregularities of the thyroid that are not associated with hyperthyroidism. Antibody production, cancer, or hypothyroidism may or may not be present. The cause of nontoxic goiters is unknown but may reflect a condition where the thyroid tissue over responds to physiologic levels of TSH. Impaired utilization of iodine may also be a cause. In the absence of hypothyroidism, patients with nontoxic goiter are usually asymptomatic, save for the discomfort of having a mass in the neck that can interfere with normal breathing and swallowing.\textsuperscript{1}

**Toxic Nodular Goiter:** Also known as TNG or Plummer’s disease, this is a more common cause of hyperthyroidism than Graves’ disease in the elderly. Patients with nontoxic multinodular goiter may develop this disease over time when some of the physical irregularities within the thyroid gland develop into functionally autonomous, hormone-secreting nodules.\textsuperscript{5} However, in TNG there is an absence of the thyroid autoantibodies characteristic of Graves’.\textsuperscript{4} Patients with TNG usually have less severe hyperthyroid symptoms than those with Graves’ (i.e., no ophthalmopathy) and serum T3 and T4 concentrations are not as elevated, though other subsequent secondary symptoms (tachycardia, palpitations) may be just as clinically significant.\textsuperscript{3}

**Thyroid Cancer**

A thyroid nodule may be benign or malignant. Definitive evaluation of such nodules is done via fine needle aspiration biopsy (FNAB). Nodules may be imaged via ultrasound or radionuclide scan using iodine 123. While a hyperfunctioning or “hot” nodule on such a scan almost always indicates a benign lesion, a hypofunctioning or “cold” nodule may be either benign or malignant. Iodine scanning is usually reserved for determining the functional status of nodules coexisting with hyperthyroidism.\textsuperscript{4,6}

The prevalence of thyroid cancer among thyroid nodules is approximately 5%. More than 75% of malignant nodules are well-differentiated cancers of the follicular epithelium: mostly papillary carcinomas carrying a relative low risk of death, and a smaller number of follicular carcinomas carrying a slightly higher risk. Rare cancers with a much higher mortality rate include: medullary cancer (originating in the calcitonin-producing cells of the thyroid, a familial form of cancer comprising 5-10% of the remaining thyroid carcinomas); thyroid lymphomas; and anaplastic carcinoma.\textsuperscript{4,6}

Conventional Medical Treatment of Thyroid Diseases
The course of treatment of thyroid disease depends both on the underlying cause and the severity of secondary symptoms.

**Hypothyroidism**

For autoimmune (Hashimoto's disease) and non-autoimmune hypothyroid syndromes, treatment of choice is supplementation with some form of pharmaceutical thyroid hormone, such as levothyroxine (aka T4 or L-thyroxine, known by the brand names Synthroid® [Abbott Laboratories, Abbott Park, IL] and Levoxyll® [King Pharmaceuticals, Bristol, TN]), among others. The body converts this pharmaceutical L-thyroxine to the active form liothyronine (T3) as needed. Exogenous T3 (liothyronine, brand name Cytomel® [Forest Pharmaceuticals, New York, NY]) may also be given instead of T4 for symptoms of hypothyroidism, especially if blood tests suggest a particular patient has difficulty converting T4 to T3. Combination T4/T3 products also exist, such as a pharmaceutical preparation made of natural porcine thyroid glands (Armour® Thyroid [Forest Pharmaceuticals, New York, NY]; risk of drug-induced hyperthyroidism can be increased through administration of exogenous T3 and combination products.

**Hyperthyroidism**

For autoimmune (Graves’ disease) and non-autoimmune (TNG) hyperthyroid syndromes, conventional medical treatments include antithyroid drugs, radioactive iodine therapy, and surgery.

The two currently approved antihyperthyroid drugs in the United States are both classified as thioureylene compounds: methimazole (Tapazole®, King Pharmaceuticals, Bristol, TN) and propylthiouracil (PTU). Both of these drugs interfere with biosynthesis of thyroid hormone by interfering with the incorporation of iodine into thyroglobulin. Long-term treatment with these drugs sometimes leads to remission of the disease.

Radioactive iodine therapy with iodine 131 is the most common treatment used in the United States for hyperthyroidism. Radioactive iodine therapy usually renders the thyroid gland non-functional, requiring supplementation with exogenous thyroid hormone (levothyroxine, aka T4 or L-thyroxine) after treatment. Armour® thyroid, the commercial pharmaceutical product derived from porcine thyroid glands, may be given as thyroid replacement instead.

Thyroidectomy is reserved for those patients with contraindications to antithyroid drugs and radioactive iodine therapy, coexisting suspicion for cancer, or with large, swollen thyroids that cause physical discomfort. Supplementation with some form of pharmaceutical thyroid hormone is required after surgery.

Drug treatment with antihyperthyroid drugs is not indicated for subacute thyroiditis with transient hyperthyroidism, since antihyperthyroid drugs will not affect the leaking of stored thyroid hormone. Other types of drugs may be offered to these patients to address the secondary symptoms of hyperthyroidism only (such as sedatives for insomnia and beta-blockers for palpitations or tachycardia).

**Thyroid Nodules**

Patients with nodular irregularities of the thyroid in whom malignancy has been excluded or deemed unlikely should proceed with periodic clinical observation.
Benign nodules may shrink with administration of levothyroxine (so-called "thyroid hormone suppression therapy"), which may be tried if the patient’s serum TSH is high or normal. Large multinodular goiters, though benign, may exert compressive symptoms and sometimes respond to thyroid hormone suppression therapy, or they may require surgical removal. Radioactive iodine 131 to reduce gland size is also an option, especially if surgery is contraindicated; however, radioiodine is more effective in, and usually reserved for, hyperthyroid conditions.

**Thyroid Cancer**

Full or partial thyroidectomy is the treatment of choice for differentiated thyroid cancers (papillary and follicular carcinomas). After such surgery, total body radiiodine scanning may be done to look for metastatic spread, and radiiodine treatment given to ablate remnant thyroid or metastatic tissue. Some form of pharmaceutical thyroid hormone product is given after surgery to replace thyroid hormone and suppress TSH, a thyroid tumor growth factor, to normal or low-normal levels. Follow up includes monitoring serum thyroglobulin levels, which should be low to undetectable after effective therapy.

Medullary thyroid cancer usually requires full thyroidectomy and cervical lymph node dissection. Serum calcitonin levels should be monitored.

Non-differentiated (anaplastic) thyroid cancers are rare but comprise aggressive forms of cancer with poor prognoses. Surgery, radiation and chemotherapy are palliative only.

**Herbal Treatment of Thyroid Disorders—Western Herbal Tradition**

There are few herbs in the Western herbal tradition specifically indicated for thyroid disease. Of these, there are little to no data on their effectiveness in humans. There are no herbs specifically indicated for the treatment of physical irregularities of the thyroid or thyroid cancer *per se*; rather, herbs in Western alternative and complementary medicine believed to affect the thyroid specifically address symptoms of either hypothyroidism or hyperthyroidism only.

**Hypothyroidism**

Kelp (*Laminaria* spp., Laminariaceae) is recommended by many herbalists for the treatment of hypothyroidism or thyroid nodules. Kelp is a rich source of iodine, which is necessary for the formation of thyroid hormone. Historically, iodine deficiency was the largest cause of thyroid swelling (commonly known as "goiter"); however, while iodine deficiency may precipitate hypothyroidism, goiter, or physical irregularities of the gland, this deficiency is rare in developed countries. Autoimmune disease, rather than iodine deficiency, is the primary cause of hypothyroidism in the United States.

While iodine is one of the oldest known remedies for thyroid diseases, iodine supplements and seaweed products should be used with caution and under medical supervision in all patients with thyroid disorders, since the effects of iodine supplementation on thyroid function are unpredictable and vary over time. Excess iodine can trigger hyperthyroidism in some patients with seemingly normal thyroid function, yet the normal physiologic response to an acute increase in plasma iodine load is temporary hypothyroidism (an adaptive response to prevent dangerous fluctuations of thyroid levels, known as the "Wolff-Chaikoff effect"). In hyperthyroid patients, supplemental iodine may temporarily suppress, but then later increase,
synthesis of thyroid hormone. A recent study of 3018 subjects in China demonstrated that excessive iodine intake may lead to hypothyroidism and autoimmune thyroiditis. Improper use of a kelp-containing supplement has been linked to at least one case of iodine-induced hyperthyroidism.

Hyperthyroidism

Four herbs are commonly suggested by Western herbalists, other practitioners of complementary and alternative medicine, and naturopathic medical textbooks for treating hyperthyroidism. Three herbs appear to have effects on thyroid hormone—lemon balm (Melissa officinalis, Lamiaceae), bugleweed (Lycopus virginicus, Lamiaceae), and gromwell (Lithospermum officinale, Boraginaceae); and one appears to reduce secondary symptoms of hyperthyroidism (heart palpitations and tachycardia), motherwort (Leonurus cardiaca, Lamiaceae).

Lemon balm is approved by the German Commission E for use internally for nervous sleeping disorders and gastrointestinal complaints. A systematic review of published articles conducted by the Natural Standard Research Collaboration in 2005 revealed that although no serious adverse effects have been reported with use of the herb, there is insufficient evidence for the use of lemon balm in treating Graves’ disease or cancer. However, freeze-dried extracts of lemon balm have been shown to have antithyroid activity in vitro by binding to TSH and preventing binding to its receptor, which prevents subsequent thyroid hormone manufacture and release. Likewise, lemon balm has been shown in vitro to interact with and prevent the binding of autoantibodies to the TSH receptor, suggesting the plant may have some use in Graves’ disease. The mechanism of action may be inhibition of TSH-stimulated cyclic adenosine monophosphate (cAMP, an enzyme activator) production. Another in vitro study revealed that aqueous extract of lemon balm inhibited the peripheral conversion of T4 to T3. No human trials have yet evaluated the efficacy of lemon balm for hyperthyroidism.

Bugleweed has also been shown in vitro to bind with TSH and TSH-like immunoglobulins, preventing binding to the receptor. Likewise, an aqueous extract of bugleweed appeared in vitro to inhibit the enzymatic reaction that converts peripheral T4 to T3. In rats, aqueous extracts of bugleweed appear to inhibit thyroid hormone production, possibly by inhibiting TSH. Although no human trials have demonstrated the efficacy of bugleweed for hyperthyroidism, the German Commission E approves internal use of the fresh or dried above-ground parts for mild thyroid hyperfunction, noting that in rare cases, with extended therapy and high doses, sudden enlargement of the thyroid can occur. The Commission E also warns against abrupt discontinuation of bugleweed.

Freeze-dried and aqueous extracts of gromwell, like those of lemon balm and bugleweed, have demonstrated TSH-binding and hormone conversion-preventing effects in vitro, respectively. Another study revealed that injections of gromwell lowered TSH, T4 and T3 levels in animals. In rats, aqueous gromwell extract has been shown to inhibit TSH and decrease conversion of T4 to T3.

Again, no human trials have examined gromwell’s efficacy for treating hyperthyroidism.

Motherwort is traditionally known as a heart tonic and uterine stimulant. In vitro the plant has demonstrated negative chronotropic effects. There are no complete
studies in humans for motherwort. It is approved by the German Commission E for nervous cardiac disorders and as an adjuvant for thyroid hyperfunction.\textsuperscript{14}

Some common plant foods contain substances that can prevent the utilization of iodine, and, subsequently, impact thyroid hormone function. They include, most prominently, members of the family Brassicaceae: cabbage (\textit{Brassica oleracea}), turnips (\textit{B. rapa}), and rutabagas (\textit{B. napobrassica}); soybeans, peanuts, pine nuts, and millet have also been reported to interfere with thyroid iodine uptake.\textsuperscript{28} While these foods must be consumed raw and in large quantities to have an antithyroid effect, this may be of clinical significance in some rare cases.\textsuperscript{12}

Herbal Treatment of Thyroid Disorders: Eastern Herbal Traditions

\textbf{Ayurvedic Medicine}

One herb in traditional Ayurvedic medicine has been studied in animals for its effects on the thyroid—the fruit of amla (\textit{Emblica officinalis}, Phyllanthaceae, syn. \textit{Phyllanthus emblica}). Administration of amla extract to hyperthyroid mice reduced T3 and T4 concentrations to a greater extent than the prescription antithyroid drug propylthiouracil (PTU).\textsuperscript{29} There are no studies of the fruit’s effect in humans.

\textbf{Chinese Medicine}

Thyroid disease is often treated by herbal medicine in China. As with Western herbal medicine, in traditional Chinese medicine (TCM) the greatest use for herbs lies in treatments for hyperthyroidism, the symptoms of which are characterized in this modality as a “\textit{yin} deficiency” or syndrome of “excess fire.” Hypothyroidism, in contrast, is characterized as “\textit{yang} deficiency.” TCM also employs herbs for treating thyroid masses and nodules, which are interpreted as “entangled \textit{qi},” “accumulated phlegm,” and “static blood.”\textsuperscript{30,31,32}

Chinese herbal remedies are traditionally given as combinations rather than single herbs. Some traditional combinations are known for use in thyroid conditions and may be sold in supplements in this form: for example, \textit{Jia Kang Wan} and \textit{Pingyin Fufang}.\textsuperscript{30} Both of these formulas contain herbs meant to target the thyroid, such as kelp, brown seaweed (\textit{Sargassum} spp., Sargassaceae), Chinese yam (\textit{Dioscorea oppositifolia}, Dioscoreaceae), fritillary (\textit{Fritillaria} spp., Liliaceae), \textit{Prunella} (\textit{Prunella vulgaris}, Lamiaceae), scrophularia (\textit{Scrophularia ningpoensis}, Scrophulariaceae), and rehmannia (\textit{Rehmannia glutinosa}, Scrophulariaceae), in addition to other herbs. Both of the formulas also contain oyster shell, a common ingredient in TCM thyroid formulas, as sea materials with a high mineral content are considered in this modality to soften and remove masses.\textsuperscript{32}

The Cochrane Collaboration recently published a systematic review, “Chinese Herbal Medicines for Hyperthyroidism.”\textsuperscript{33} Cochrane reviews (published quarterly and available by subscription) regularly collect and review all available evidence for and against the effectiveness of various treatments (medications, surgery, etc) for specific conditions, taking care to include evidence that is unpublished, published in languages other than English, or unlikely to appear in major databases. In order to assess the effects of Chinese herbal medicines for treating hyperthyroidism, the authors of the review searched several databases (both in English and Chinese) for randomized controlled clinical trials of therapy for hyperthyroidism with Chinese herbs alone, or herbs in combination with antihyperthyroid drugs or radioactive
iodine. Studies that met review inclusion criteria were obtained and the original authors contacted and interviewed to determine whether trial participants were correctly randomized. Only 13 trials met the Cochrane reviewers’ criteria at the time of completion of the review, while the authors of 52 additional trials could not be contacted; those are still waiting assessment.

Reviewers assessed the quality of evidence and detailed the specific outcomes in each of the 13 trials. Trials could not be directly compared, since the herbal preparations used in the studies were all different from each other. The reviewers found that none of the trials used double blinding. Exact causes of hyperthyroidism were detailed in only 4 of the studies. Primary outcomes in the trials varied and included relapse rates, adverse effects, clinical symptoms, physical symptoms, and thyroid function tests (serum T3, T4, and TSH). Each of the 13 studies evaluated a specific formula containing at least 5 or more combined Chinese herbs (2 of these studies did not mention the specific contents of formulas). Formula types tested by the studies included capsules of dried herbs, tablets of dried herbs, ampoules of decocted herbs, and injections of decocted herbs. A total of 65 different Chinese herbs were identified throughout the 13 formulas.

While the Cochrane review authors conclude in their systematic review that Chinese herbal medicines, combined with conventional antihyperthyroid drugs, may be of some benefit to patients in relieving hyperthyroid symptoms, they also conclude that the current available studies of Chinese herbal medicine used to treat hyperthyroidism were too poorly controlled and subject to potential conflicts of interest to provide a reliable indication for any type of Chinese herbal formula for treating hyperthyroidism. Therefore, according to the criteria employed by this systematic review, there is currently no strong clinical trial-based evidence for the use of any Chinese herb or herbal formula for the treatment of hyperthyroidism. Randomized, double-blind, placebo-controlled trials of Chinese herbs and herbal formulas are still needed to provide evidence for the efficacy of Chinese herbs in treating one or more specific causes or symptoms of hyperthyroidism.

Data from some of the clinical studies in humans for TCM formulas containing the following herbs are summarized in English in the Cochrane review, and also in other secondary sources. In vitro and animal data on these herbs published in English are also referenced below.

**Kelp and Brown Seaweed:** Kelp seaweed (Kun Bu in Mandarin) and brown seaweed (Hai Zao and Lou Shu in Mandarin and Hoi Chou in Cantonese) are common ingredients in TCM remedies for thyroid. Seaweeds are known traditionally as dissolvents that can soften chronic swellings, decongest lymphatic tissue, and reduce tumors. Modern research confirms seaweed as a rich source of trace minerals, including iodine; however, the iodine content varies with species and preparation of the plant. Bioavailability of iodine contained in seaweed is generally high (80-96%). As a result, clinicians must carefully dose and observe patients treated with seaweed-containing products due to these variabilities and also the unpredictable effects that iodine can have on thyroid tissue, as enumerated previously. Another issue regarding use of seaweed in treatments is the potential for contamination by pollutants. Research shows that Sargassum biosorbs cationic metals, especially lead, in both low- and high-salt containing wastewater.
Clinical studies in English evaluating the effects of *Laminaria* spp. or *Sargassum* spp. on thyroid disorders in humans are lacking.

**Chinese Yam:** Traditional use of Chinese yam (*Huang Yao Zi* in Mandarin and *Wong San Ji* in Cantonese) root include to strengthen *yin*, resolve thyroid tumors, and hypo- and hyperthyroidism (decoction or tincture). Modern *in vitro* research reveals antibacterial and antitumor properties, but no studies or abstracts in English were found documenting the root’s effect on thyroid disease in humans. *Dioscorea* rhizome or *shanyao* was identified as a component of a TCM herbal formula in one of the 13 trials evaluated by the Cochrane review. This unblinded trial of 147 patients with Graves’ disease evaluated 20 mL 3 times daily of the decocted herbal formula *jiakangxin* plus radioiodine, versus the antithyroid pharmaceutical drug methimazole alone, versus radioiodine alone. Outcomes evaluated included subjective symptoms, body weight, and thyroid hormone levels after 6 months of treatment. Statistical significance was found in improved hormone levels only in the radioiodine and radioiodine plus *jiakangxin* groups, compared to the methimazole alone group, but the Cochrane review concluded the presence of potential conflicts of interest in the study.

**Fritillary:** The bulb of two species of fritillary (*Fritillaria cirrhosa* and *F. thunbergii*, *Bei Mu* in Chinese) is employed in TCM for “heat clearing” properties valuable in resolving cough, nodules, swellings, and thyroid cancer, among other things. Modern research reveals the genus to be rich in a wide range of steroidal alkaloids. Some may have acetylcholinesterase-inhibiting properties, which raises the potential for toxicity similar to organophosphate insecticides (with hypersecretion, excitation, diarrhea, bronchospasm, slowed or rapid pulse, and even seizures). No studies or abstracts in English were found documenting the bulb’s effect on thyroid disease in humans. Thunberg fritillary bulb or *zhebeimu* was identified as a component in formulas studied in two of the 13 trials evaluated by the Cochrane review.

The first, in 2003, was a parallel group, unblinded trial of 368 cases of hyperthyroidism defined by specific threshold levels of plasma thyroid function tests. One ampoule per day of the herbal formula *Erdong Tang* with *Xiaoluwan Jiawei* was decocted with water and orally taken in the morning and evening and compared to the control group taking either propylthiouracil (PTU) or methimazole. Outcomes included symptom relief, plasma thyroid hormone levels for 1 year after discontinuing the herbal formula or drugs, and relapse rates. While the study found symptom relief improvement, plasma hormone improvement, and relapse rates to be better in the herbal treatment versus the control group, the Cochrane reviewers note potential conflicts of interest in the study.

The second trial including fritillary, published in 2005, was also of parallel design and unblinded. It evaluated 62 cases of hyperthyroidism with symptoms of sweating, dysphoria, palpitations and emaciation. Interventions compared were the herbal formula *jiakangxiao* (which included fritillary bulb) plus treatment with either methimazole or PTU, versus methimazole or PTU alone. Outcomes included symptom relief, measurement of plasma thyroid hormones after 50 days of treatment, and relapse rates after 1 year. The study found statistically significant improvement in the treatment versus control group in all outcomes, though the Cochrane reviewers note potential conflicts of interest in the study.
**Prunella:** The flower spike of selfheal (aka Prunella, *Xia Ku Cao* in Mandarin; *Ha Gu Chou* in Cantonese) are used in TCM as an antipyretic, diuretic, astringent, and lymphatic decongestant. Modern studies support selfheal’s ability to reduce inflammation and modulate the immune system *in vitro* and to suppress antibody production in mice. No studies or abstracts in English were found documenting the flower’s effect on thyroid disease in humans.

*Xia Ku Cao* was identified as a component in 4 of the 13 trials evaluated by the recent Cochrane review. *Xia Ku Cao* is included in the formula *Erdong Tang* with *Xiaoluwan Jiawei*, which was evaluated in the trial by Qiu et al (2003) enumerated above. In 1999, an unblinded parallel group trial evaluated 105 hyperthyroid patients taking methimazole plus 1 ampoule per day of an herbal formula including *Xia Ku Cao*, versus a control group taking methimazole alone. Outcomes included symptoms of palpitation, fatigue, emaciation and heat intolerance as well as plasma concentrations of thyroid hormones. The study found that while both groups improved with treatment, there was no statistically significant difference between the groups with regard to plasma hormone levels or symptom relief. The Cochrane review noted potential conflicts of interest in the study.

In 2001, another unblinded, parallel group trial evaluated 84 patients with hyperthyroidism identified through plasma thyroid hormone levels and clinical symptoms of palpitation, dizziness, tremor, fatigue, sweating, and emaciation. Methimazole plus an herbal formula containing *Xia Ku Cao* given in an unidentified dosage form and frequency were compared to methimazole alone for 2 months with 1 year of follow-up. The study found greater improvement in the treatment group compared to control with regard to the outcomes of symptom relief and plasma thyroid hormone levels at 2 months and relapse rates after 1 year. The Cochrane review notes potential conflicts of interest in the study.

Finally, *Xia Ku Cao* was part of a formula called *Jiakang mianyi jiaonang* evaluated in 2005 on 44 subjects with hyperthyroidism in a study of 86 hyperthyroid patients with diffuse toxic goiter (aka Graves’ disease) or subacute thyroiditis. PTU was taken by both the treatment and control groups; the treatment group additionally took 4 capsules of *Jiakang mianyi jiaonang* formula 3 times daily for 90 days, while the control group took the formula *jiakangning pian* (the herbs in this formula were not specified in the Cochrane review) at 6 tablets 3 times per day. The study was of parallel group design and single-blinded. Outcomes included symptom relief, body weight increase, and plasma thyroid hormone levels. The study found no statistically significant improvement in treatment versus control groups for any outcome. The Cochrane review notes the herbal preparation was prepared by the authors’ hospital and that this was a local government-supported project. In addition, the lack of distinction in this study between patients with Graves’ disease and those with subacute thyroiditis may have impacted outcomes since, as enumerated above, neither antithyroid drugs like PTU nor antithyroid botanicals can prevent the leaking of stored thyroid hormone from inflamed tissue that causes the transient hyperthyroidism characteristic of this condition. Furthermore, the lack of distinction between these two patient groups in this study would confound any potential immune-modulating benefit of the *Xia Ku Cao*-containing herbal formula.

**Scrophularia:** Scrophularia (*Xuanshen* in Mandarin or *Hei Shen* in Cantonese) root is administered in TCM fresh or dried to “drain fire and disinhibit the throat.” *Scrofula* is an archaic term describing tubercular swelling of the lymph
nodes; its inclusion in the Latin binomial of this plant is indicative of its traditional use to treat nodules and goiter. Modern *in vitro* research reveals that plants in this genus contain antimicrobial, anti-inflammatory, and antitumor properties. No studies or abstracts in English were found documenting the root’s effect on thyroid disease in humans. Scrophularia root or *Xuanshen* is included in 2 formulas evaluated in the Cochrane review of included studies of Chinese herbal medicines for hyperthyroidism. *Xuanshen* is included in the Qiu et al (2003) study of the TCM herbal formula *Erdong Tang* with *Xiaoluwan Jiawei* described above in the sections on prunella and fritillary. *Xuanshen* was also one of 10 herbs in the formula *Yikang wan*, given as 1 pill 3 times per day plus methimazole, versus methimazole alone in an unblinded parallel group study of 62 hyperthyroid patients. Outcomes included clinical symptom relief and thyroid function tests at 2, 3, and 4 weeks after treatment. The study found improvement in all outcomes in more individuals in the treatment group vs. control, but statistical significance is unclear. The Cochrane review concluded there was potential conflict of interest in that the herbal formula was provided by the company sponsoring the magazine in which the study was published.

**Rehmannia**: Rehmannia (*Shengdi* in Mandarin) prepared or cured root or rhizome is considered in TCM to be nourishing to the liver and blood and also to have heat-clearing properties. Its use in thyroid formulas stems from the idea in TCM that thyroid disorders are ultimately rooted in liver and kidney disorder. Modern *in vitro* studies reveal that extracts of the plant may have antioxidant and anticancer activity. A study in mice suggested a hepatic protective effect. No studies or abstracts in English were found documenting the root preparation’s effect on thyroid disease in humans. Rehmannia rhizome or *Shengdi* is part of the herbal formula *Erdong Tang* with *Xiaoluwan Jiawei* evaluated by Qiu et al (2003) discussed previously. It is also part of the formula *Yikang wan* evaluated by Huang (2003) as summarized above for the herb scrophularia. A third study included *Shengdi* as one of 12 herbs, also including prunella flower. A fourth study included in the Cochrane systematic review examined *Shengdi* as one of 4 herbs of a formula used in a parallel single-blind study of 93 patients with Graves’ disease. The herbs were made into granules, and 1 ampoule per day was given for 8 weeks to the treatment group along with PTU, while PTU alone was used by the control group. Outcomes included plasma thyroid function tests. Free T3 and free T4 of both treatment and control groups were improved at 8 weeks; statistical significance is unclear. The Cochrane reviewers concluded there was potential conflict of interest in the study.

**Conclusion**

Herbal medicines may be used as adjunct treatments for autoimmune thyroid diseases such as hypothyroidism and hyperthyroidism, the physical abnormalities (often referred to nonspecifically as “goiter,” “nodules,” or “thyroiditis”) that can result from or precipitate the physical symptoms of these diseases, and for the malignant nodules that characterize thyroid cancers. However, large, randomized, double-blind, well-controlled studies in humans for their efficacy in any of these disorders are lacking. Most of the studies of botanical medicines for the treatment of thyroid disease have centered on hyperthyroid conditions. For herbs used to treat hyperthyroidism in TCM, a recent systematic review of 13 trials that met reviewers’ inclusion criteria suggests that some herbal formulas used in conjunction with pharmaceutical antithyroid drugs may provide marginal improvement over
antihyperthyroid drugs alone with regard to symptom relief, thyroid hormone function tests, and relapse rates. However, reviewers evaluated these studies as low quality due to small sample sizes, unblinding or single blinding, and potential for conflicts of interest. The authors of the systematic review have 52 more studies to evaluate, which may yield more information. Currently there is scant published information supporting use of TCM herbal formulas alone for treating hyperthyroid conditions.

Therefore, initiation of treatment with any herbs for any type of thyroid disorder should be considered only under the supervision of a healthcare provider well trained in the use of herbs or TCM for thyroid disease. Such treatment is best done using information obtained with some tools of conventional medicine—blood chemistry analysis, FNAB, ultrasound, and radionuclide imaging—which can give the practitioner and patient an idea about the possible source, characteristics, and progress of thyroid disease. Because disorders of the thyroid are complex, idiosyncratic, and impact other body systems, courses of treatment with either alternative or conventional regimens (or both) must be carefully tailored to the individual, with assiduous attention to the individual’s symptoms and plasma thyroid function analysis.

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