# HYPOTHYROIDISM

## A COMPARATIVE STUDY OF ALLOPATHIC AND AYURVEDIC MANAGEMENT OF THE DISEASE

BY
AJITA PATEL

PAPER SUBMITTED IN PARTIAL FULFILLMENT FOR THE REQUIREMENTS
FOR A CAS DEGREE

CALIFORNIA COLLEGE OF AYURVEDA
1117A EAST MAIN STREET
GRASS VALLEY, CA 95945

SUBMITTED: JANUARY 22nd 2009

sarve bhavantu sukhinaḥ
sarve śantu nirāmayāḥ
sarve bhadrāṇi paśyantu
mā kaścidduḥkhabhāgbhavet

सर्वे भवन्तु सुखिनः
सर्वे शन्तु निरामयाः ।
सर्वे भद्राणि पश्यन्तु
मा कश्चिद्दुःखभाग्भवेत् ॥

Happiness be unto all.
Perfect health be unto all.
May all see what is good.
May all be free from suffering

sarve: all, entire, every
bhavantu: may there be
sukha: ease, comfort, happiness
śanta: peace, serenity
nir: without
āmayāḥ: disease, sickness
bhadra: good, gracious, friendly
paśyantu: may all see
mā: not
ka: who
cit: thought, intellect
duḥkha: pain, sorrow, difficulty
bhāgbhavet: let one be a partaker or beneficiary of

*Brihadaaranyaka Upanishad 1.4.14*

## Abstract

According to American Association of Clinical Endocrinologists, over 27 million Americans have some form of thyroid disease with hypothyroidism being most prevalent and significant as it can go undetected for many years. Almost all forms of thyroid disease eventually result in hypothyroidism, a disease that directly affects every cell of the body and as a result affects all aspects of physical and emotional well being. This is a humble attempt to take a closer look at the possible causes, symptoms and effective methods of managing this pervasive disease from both the perspective of modern medicine as well as using Ayurvedic principles, in the hope that it improves the quality of life for those suffering with the disease.

# Acknowledgements

With grace, gratitude and reverence overflowing from the sacred depths of my heart I offer my salutations to all the teachers from the past and present who have contributed to my spiritual journey. I am deeply inspired by their knowledge and blessings and offer my humble respects and love for guiding me towards the Divine.

I feel immensely blessed to be able to share this journey with my family whose unconditional love, encouragement, and support has allowed me to immerse myself into the wisdom of Ayurveda and Vedanta.

# Table Of Contents

# Physiology Of The Thyroid Gland

The thyroid is a two inch long endocrine gland, weighing less than one ounce, located between the larynx and the collarbones, just under the skin and muscle layer of the front of the neck. It looks like the shape of a butterfly with two lobes wrapped around the trachea and joined together by a narrow band of thyroid tissue known as the isthmus. The gland is made up of epithelial cells or thyrocytes formed into millions of sac like follicles which produce and secrete thyroid hormones.

Thyroid hormones regulate how the body breaks down food and either uses that energy immediately or stores it for the future. Every cell in the body depends upon thyroid hormones to maintain thermogenic and metabolic homeostasis.

The thyroid gland absorbs iodine, found in foods, iodized salt and supplements and converts it into thyroid hormones: thyroxine (T4) and triiodothyronine (T3), by combining with the amino acid tyrosine. The numbers 3 and 4 refer to the number of iodine molecules in each thyroid hormone molecule. The T3 and T4 molecules are then released into the blood stream and are transported throughout the body to regulate metabolism, the conversion of oxygen and nutrients into energy at the cellular level. Release of thyroid hormone also stimulates mental activity and increases the activity of other hormone-producing glands.

The normal thyroid gland produces about 80% T4 and about 20% T3. The rest of T3 supply is produced from T4 that is converted to T3 in the muscles, liver and kidneys. Some T4 is stored inside the lobes of the thyroid gland for future use. Biologically, T3 is considered the more active hormone - the one that actually functions at the cellular level and is also considered several times stronger than T4. A third hormone Calcitonin, is also produced by the thyroid gland which causes the kidneys to discharge

more calcium into the urine, and raises the amount of calcium stored in the bones and calcium levels in the blood.

Thyroid hormone levels in the body are maintained by the brain through a finely controlled feedback mechanism involving the hypothalamus and the pituitary gland. The hypothalamus constantly monitors the pace of many of the body's functions and many external factors such as temperature, stress and so on. In response to any of these factors, the hypothalamus secretes Thyrotropin-releasing Hormone (TRH) that control the anterior pituitary gland which in turn secretes Thyroid Stimulating Hormones (TSH) that then direct the thyroid to make thyroid hormones T4 and T3. These are released into the bloodstream carried by a plasma protein known as thyroxine-binding globulin or TBG. Once in the blood stream, the thyroid hormones interact with receptors located inside the nucleus of specific cells, n turn triggering a certain function that directs the rate at which that organ needs to operate.

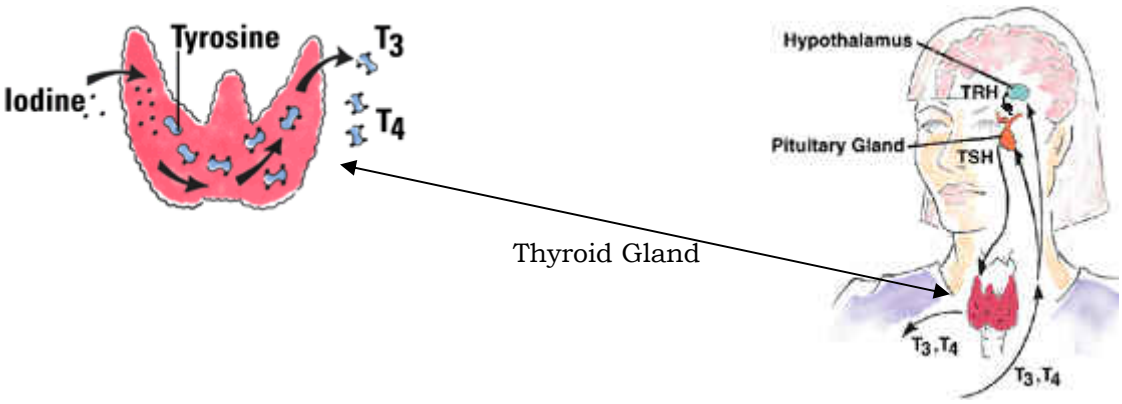


**Figure 1:** Thyroid Gland Function

Thyroid hormones directly or indirectly regulate all body functions; there is not a single cell that doesn't depend on thyroid hormone for regulation and for energy. Thyroid hormones influence how the digestive system absorbs nutrients and eliminates, as well as how the brain, lungs and heart function. Furthermore, in a growing child, these

hormones influence normal bone growth, proper sexual development and cognitive development.

## Diseases Of The Thyroid Gland

Diseases of the thyroid gland are very specific and distinguishable from one another because of the different causes and symptoms, although in prolonged cases the end result and consequently the lifelong treatment is the same. Some common conditions involving the thyroid are: GOITER (enlargement of the thyroid gland) cancer, HYPERTHYROIDISM (too much thyroid hormone from an overactive thyroid), NODULES (small lump in the thyroid gland), THYROIDITIS (swelling of the thyroid gland) and HASHIMOTO'S DISEASE (antibodies target the thyroid gland and destroy its ability to produce thyroid hormones). It is interesting that many treatment options used today such as anti-thyroid drugs, radioactive iodine therapy, surgery to remove part or all of the gland for the various thyroid conditions described, usually result in HYPOTHYROIDISM, which is one of the most common thyroid disorders causing an under active thyroid . With Hashimoto (also known as Hashimoto's thyroiditis, autoimmune thyroiditis, or chronic lymphocytic thyroiditis), there is a slow and steady destruction of the gland. This is a very common cause of hypothyroidism, although initially, there can be periods where the thyroid sputters back to life, even causing temporary hyperthyroidism, then a return to hypothyroidism. So periods of anxiety, insomnia, diarrhea and weight loss may be followed by periods of depression, fatigue, constipation and weight gain.

## Hypothyroidism – Definition, Symptoms And Causes

Hypothyroidism generally describes an under-active thyroid that does not produce enough thyroid hormones causing an overall decrease in physical and mental activity. It is more common in women and people over 60 years of age. Hypothyroidism can result from a defect anywhere in the hypothalamic-pituitary-thyroid axis, either insufficient

TSH from the pituitary or insufficient TRH from the hypothalamus. In the vast majority of cases, it is primary hypothyroidism, which is decreased secretion of thyroxine (T4) and triiodothyronine (T3) by the gland itself, which results in a compensatory increase in TSH secretion. Thus, the combination of a low serum T4 and a high serum TSH concentration both confirm the diagnosis of hypothyroidism and indicate that it is due to primary thyroid disease.

## Symptoms

Symptoms of hypothyroidism can be very subtle and are notorious for their nonspecific nature and for the way in which they mimic the symptoms of other diseases. People often believe their symptoms are due to stress, depression, or “getting older," or may frequently mistake them for other conditions such as menopause, arthritis, fibromylgia, depression or chronic fatigue syndrome. Because of this, hypothyroidism can go undiagnosed, sometimes for many years. Symptoms appear in almost every organ system of the body and vary from mild to severe and from person to person. Some common symptoms of hypothyroidism are:

- Fatigue, less energy or trouble awakening in the morning, need for more sleep, and tendency to fall asleep during the day.
- Moderate weight gain or the inability to lose weight.
- Dry, itchy skin, dry mucous membranes.
- Puffy face or around the eyes.
- Cold intolerance.
- Joint and muscle pain.
- Constipation.
- Dry, thinning, coarse hair or loss of outer edge of eyebrows.

- Decreased sweating.
- Heavy or irregular or more painful menstrual periods and impaired fertility.
- Depression and irritability.
- Slow or irregular heart rate.
- Slow Achilles reflex and edema of feet.
- Slow movement, slow or fuzzy thinking, poor memory.
- Slow speech, horse voice, enlarged neck.
- Low body temperature.
- Yellowish or pale skin and dull facial expression.

Other symptoms can include premature or exaggerated symptoms of menopause or post partum symptoms, low sex drive, eye problems such as dryness, sensitivity to light, difficulty swallowing, hearing loss, more frequent and prolonged infections, shortness of breath, tightness in the chest, light headedness, dizziness, edema of various parts of the body, headaches, trigger finger, limited joint mobility and carpal tunnel syndrome. Understanding the effects of thyroid hormones circulating in the blood stream helping cells convert oxygen and calories into energy, and the importance of this on the proper functioning of the brain and every system in the body, makes it easier to acknowledge the often vague and wide range of symptoms on the cardiovascular, respiratory, skeletal, muscular, digestive, reproductive and lymph systems.

Having hypothyroidism also increases the probability of developing other immune and endocrine system diseases since an imbalance in one part of the system will create an imbalance in another. Research continues to highlight and link even seemingly unrelated issues to thyroid problems. In fact, researchers from University of Alabama at Birmingham have found that thyroid disorder may be a risk factor for developing glaucoma. [1]

Left untreated, the symptoms of hypothyroidism will usually progress, greatly reducing mental and physical performance, as well as causing high cholesterol, goiter, heart disease, hypoglycemia and hypothermia. The worse the untreated hypothyroidism becomes, the less the body is able to cope with stressors like cold weather, infections, or minor surgery. Severe hypothyroidism is known as MYXEDEMA whereby the body slows to the point that it starts to shut down. At its worst, the patient falls into a coma and has to be hospitalized.

## Etiology

There are a number of possible causes for hypothyroidism:

1. Thyroiditis or inflammation of the thyroid gland, usually caused by an autoimmune attack as in Hoshimoto's, or by a viral infection, that cause the thyroid to release its whole supply of stored thyroid hormone into the blood at once, causing brief HYPERthyroidism. Once all of the stored hormone has been released, the thyroid becomes under-active.

2. Radiation or Radioactive iodine treatment for tonsils, adenoids, lymph nodes, thymus gland problems, acne, Graves' disease, hyperthyroidism, Hodgkin's disease, lymphoma, cancer, goiter, nodules typically leave patients hypothyroid.

3. Medicines like amiodarone, cordarone, lithium, interferon alpha, and interleukin-2, adrenal steroids like prednisone and hydrocortisone, thalidomine, immunosuppressants and antiretrovirals can interfere with the thyroid glands ability to make thyroid hormone. These drugs are most likely to trigger hypothyroidism in patients who have a genetic tendency to autoimmune thyroid disease.

4. Over consumption or shortage of iodine in the diet. Iodine comes into the body in foods, mainly dairy products, chicken, beef, pork, fish, and iodized salt, sea

weed like kelp and bladderwack. Around 150 ug of iodine is needed per day for normal thyroid function. Taking in too much iodine can cause or worsen hypothyroidism.

5. Congenital hypothyroidism. A few babies are born without a thyroid, a partly formed thyroid or have the 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 hormones for a while and then may no longer be able to keep up with the need, so the person becomes hypothyroid as they grow.

6. 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 hormones.

7. Overconsumption of isoflavone-intensive soy products, such as soy protein, capsules, and powders. Especially at risk are infants given soy based formulas. According to the FDA "there is abundant evidence that some of the isoflavones found in soy, including genistein and equol, a metabolize of daidzen, demonstrate toxicity in estrogen sensitive tissues and in the thyroid". Isoflavones are inhibitors of the thyroid peroxidase which makes T3 and T4. Inhibition can be expected to generate thyroid abnormalities, including goiter and autoimmune thyroiditis. There exists a significant body of animal data that demonstrates goitrogenic and even carcinogenic effects of soy products. Moreover, there are significant reports of goitrogenic effects from soy consumption in human infants and adults. [2]

8. Overconsumption of uncooked goitrogenic foods, such as Brussels sprouts, broccoli, rutabaga, turnips, kohlrabi, radishes, cauliflower, African cassava, millet, babassu, corn, cabbage, cauliflower, mustard greens, kale, peanuts,

walnuts, spinach, carrots, canola oil, strawberries and peaches. Goitrogens block the action of iodide and decrease thyroid function. Cooking destroys the isothiocyanate enzymes that are goitrogenic in these foods.

9. Exposure to Perchlorate. Perchlorate has been studied for its role in thyroid disease as it blocks iodine from entering the thyroid and prevents further synthesis of thyroid hormone. Perchlorate is a byproduct of rocket fuel production that has been found to contaminate parts of the nation's drinking water supply, as well as fruits, vegetables and grains irrigated by perchlorate-contaminated water, milk and milk products from cows that grazed on contaminated grasses. However there is much controversy on how much perchlorate is acceptable in our food and water. [3]

10. Exposure to other chemicals. There is strong evidence that certain toxic chemicals especially those found in various insecticides may act as endocrine disrupters and may be detrimental to the immune and the endocrine system. [4]

11. Having other autoimmune or endocrine disease increases the risk of developing hypothyroidism.

12. Age, pregnancy and menopause are also factors in increasing the risk of hypothyroidism

13. Vitamin deficiencies can also lead to low levels of thyroid hormones according to many naturopaths.[5] Zinc, vitamins E and A function together in many body processes including the manufacture of thyroid hormone. Vitamin C, B2 riboflavin, B3 niacin and B6 pyridoxine are also necessary for normal thyroid production. A deficiency in any of these nutrients could result in lower levels of thyroid hormones produced.

14. As with any disease, major emotional stress or major physical stress is considered an environmental factor for autoimmune thyroid disease.

## Diagnosis

Hypothyroidism is based almost exclusively upon measuring the amount of thyroid hormone in the blood, usually the level of TSH. The normal range used to be from 0.5 to 5.5 mIU/L. However, the American Association of Clinical Endocrinologists has now revised this to range to 0.3 to 3.0 mIU/L, thereby increasing the total number of people with thyroid disease from approximately 5 percent of the population to an estimated 20% of the population.

Other blood tests that may be done to help diagnose hypothyroidism include those that will detect levels of T4, T3, Thyroglobulin(Thyroid Binding Globulin, TBG), T3 Resin uptake (T3RU), Thyroid Peroxidase Antibodies (TPOAb), Antithyroid Peroxidase Antibodies, Antithyroid Microsomal Antibodies, Antimicrosomal Antibodies, Thyroglobulin Antibodies, Antithyroglobulin Antibodies, Thyroid Receptor Antibodies (TRAb) and Thyroid-Stimulating Immunoglobulins (TSI).

There is no consensus as to what is considered the normal range for these hormones nor is there any consideration for the differences in what is normal for one individual may not be for another, and there is a tendency to over focus on lab test reports to the exclusion of symptoms and clinical observation.

## Treatment

With allopathy there is no cure. It is a lifetime treatment unless it is transient and requires only short-term therapy, as in postpartum thyroiditis, or when it is caused by a drug, such as lithium or an iodine-containing drug, and the drug is discontinued. Based on lab studies, in a majority of cases, based on lab results, the doctor will prescribe some form of thyroid hormone usually between 75 and 250 microgram of pure

synthetic T4, taken once daily. Usually within a few weeks, this successfully treats the symptoms of hypothyroidism in most patients and once a stable maintenance dose has been determined using lab results an annual check-up is usually sufficient. However there are some serious concerns with this treatment plan. Firstly, there are variations in the potency of T4 made by different manufacturers; including generic preparations. It is not always easy to determine which brand and what dose will be the most effective. The current branded forms of synthetic T4 are Synthroid®, Levoxyl®, Levothyroid®, and Unithroid® and the generic preparation is Levothyroxines. The second area of concern is that many patients on T4 replacement have a subnormal TSH. TSH values of less than or equal to 0.1 mU/L, carry a risk of development of a trial fibrillation and are associated with bone loss. For the few patients who do not feel completely normal taking T4 alone, the combination of synthetic T4 and T3 (Cytomel®) is prescribed, although this remains controversial as different clinical studies have shown opposing results. Desiccated animal thyroid, (dried and powdered) mainly obtained from pigs, was the most common form of thyroid therapy before T4 was able to be synthesized in a pure form. Desiccated thyroid contains both T4 and T3. Again there is controversy on which is better and some doctors may use synthetic T4, some a combination of T4 and T3 and some prefer the desiccated natural hormone according to which clinical data they chose to use. Yet despite biochemical euthyroidism (normal lab results), there are many patients on hormone replacement, whose symptoms of tiredness, lack of energy, discrete cognitive disorders and mood disturbances are not relieved.

To further complicate matters, there is even much controversy on how and when to take the thyroid hormone replacement as there are studies done that indicate that taking T4 crushed in a powder form may be more effective for some patients than taking it in tablet form.[6] Also taking the pill at night is better for some,[7] while taking it an hour before breakfast has proved better in some studies.[8] To further complicate matters, there are countless scientific studies that reveal a number of random foods that are

being added to the list of interferers of T4 intestinal absorption. The list includes coffee,[9] milk or other calcium supplements[10] dietary fiber[11] and of course other medications like, Iron supplements or multivitamins containing iron, [12] antacids that contain aluminum or magnesium, some ulcer medications, such as sucralfate and some cholesterol-lowering drugs, such as cholestyramine and colestipol.[13]

Leaving aside all the debates on the specifics of taking the replacement hormones, the solution is as simple as taking a pill everyday for the rest one's life and having annual physicals including blood tests. The only real side effects are those of not getting enough, or getting too much in which case hyperthyroid symptoms begin to develop. With this approach, the role of the patient is a passive and limited one: take a regular blood test and based on the lab results, take an appropriate dose of the thyroid hormone pill every day for the rest of your life. No changes in lifestyle are prescribed and it is a simple, clinical, objective and standard solution for every thyroid patient, requiring very little of the patient and the doctor's time. There has been no need to address any other issues besides keeping the levels of thyroid hormone within a normal range.

## Ayurvedic Interpretation

Ayurveda offers a very different approach to understanding the cause and the treatment for this and other chronic diseases with its emphasis on treating the whole person not just focusing on the specific part that has disease. It is a comprehensive approach that addresses mind, body, behavior, beliefs and environment. Treatment of disease is highly individualized and depends on the *prakruti* of the patient, the states of *ama*, *agni* and the interplay of *doshas* in the *vikruti.*

## *Nidana*

From an ayurvedic perspective, the causes outlined previously are valid and addressed with the herbal *chikitsa* that follows. Going deeper however, the ultimate cause of all disease is spiritual. Ayurveda considers the ultimate basis of disease to be the loss of one's connection to or forgetting one's true nature as spirit, the unified field of pure consciousness, which is the innermost core of one's being. The ultimate basis of prevention and cure is restoring one's conscious connection to (or memory of) this pure consciousness. According to ayurveda, health is being firmly established in the Self. Forgetting this spiritual nature and living as sensory beings, we get caught up in a web of likes and dislikes, making unwholesome choices and disturbing first the subtle energies of *prana*, *tejas* and *ojas* and then leading to imbalance in the *doshas* in the physical body which finally cause disharmony and disease.

As with all disease, the importance of the effect of stress on the body cannot be denied and meditation can be very effective for this. According to the Caraka Samhita, of great importance is the intimate relationship between mental activities and physical functions and any disturbance in one, affects the other and causes disease. "Wholesome food taken even in proper quantity do not get properly digested when the individual is afflicted with grief, fear, anger, sorrow, excessive sleep and excessive vigil".[14]

According to Sushruta Samhita, a healthy individual is one whose *doshas* are in balance, whose appetite is good, whose *dhatus* are functioning normally, whose *malas* are in balance, and whose body, mind, and senses remain full of bliss. "What is it in man", asks Sushruta, "that falls sick? What is it that we treat medicinally? The body or the mind?" Sushruta says that anything that afflicts the inner man is disease.

Dr Lad specifically states that "certain repressed emotions such as grief and sadness can also impair the function of the thyroid gland". [15]

## *Samprapti*

As far as the difficulty of diagnosing thyroid issues because of the vague and psychosomatic nature of the symptoms, ayurveda takes a different approach. It is not always possible to name all types of diseases in definite terms. "When aggravated, one and the same *dosha* may cause manifold diseases, depending upon the various etiological factors and the sites of manifestation". [16] Furthermore, every patient is unique in terms of the nature of his or her illness and its precise clinical presentation and thus the needed treatment. Rather than focusing on medical terms, the importance is on understanding how the symptoms are manifested and the pathogenesis.

Dr. Marc Halpern places the thyroid – *avatu granthi*, as part of the *rasavaha srota* as it is mainly a hypervascular epithelial tissue. This is supported by Caraka [17] who lists the thyroid disease under the peripheral or external system. Sushruta has described that out of seven layers of the skin, the sixth layer r*ohini* is *galaganda rogadhistana*. *Galaganda* most probably refers to goiter or nodule as both Caraka and Sushruta describe it as swelling in the anterior angle of the neck.[18]

As for the *doshic* involvement, Dr. Marc Halpern states that "This condition most often begins as a *vata- pitta* imbalance, but followed by *vata* pushing *kapha* out of balance".[19] Caraka's brief mention of *galaganda* (goiter) does support the theory that thyroid disease is a *vata/kapha*. Certainly the symptoms are mainly either *vata* or *kapha* in nature. It is easy to see how a long term *vata-pitta* vitiating lifestyle can deplete *ojas* which is characteristic of many chronic diseases.

Understanding that the process of disease in the physical body begins in the digestive system. Dr. Marc Halpern explains the *sanchaya* and *prakopa* stages as "*avalambaka kapha* having been pushed by *vata* accumulates in the *annavaha srota*, overflows to the *rasa* and *rakta dhatus* and relocates into the thyroid gland". The thyroid, being a vital

organ, belongs to the central disease pathway, and is the *khavya guna* -weak point in the body. This is where the disease has relocated and manifested in and as the general symptoms indicate, the disease has diversified throughout the body.

## *Chikitsa*

Research over the last 100 years has shown encouraging results for Ayurvedic treatment of various ailments, especially chronic disorders. Since the endocrine system regulates the essential functions of the body like temperature, reproduction, growth, immunity, and aging, it stands to reason that this should be the hub of vitality and well being. With *rasayana chikitsa* – that which promotes longevity, the very purpose of which is to delay the degenerative process in the body by improving memory, body strength, nourishing immune system and the whole body. *Rasayana* therapies usually mean undergoing a thorough *pancha karma* process followed by taking specific *rasayana* herbs. However there are behavioral *rasayanas* that offer specific guidelines to increase resistance to disease, reverse any deterioration and promote vitality and stamina. This is done by balancing the three *doshas* - v*ata*, pi*tta*, and k*apha.* Keeping in rhythm with the constant ebb and flow of the *doshas* requires constant vigilance. Along with taking *rasayana* herbs, building *ojas* and increasing the quality of *satva* is the goal gradually realized by following ayurvedic guidelines for the proper management of the three pillars of health (food, sleep and *brahmacharya*), observing *dinacharya and* appropriate *ritucharya* practices (with *abhyanga*, neti, *nasya*, *yoga*, *pranayam,* meditation, and *pancha karma*). Administered early in life, these *rasayana* practices can help one avoid genetic predispositions for certain diseases and when diseases do occur, the intensity of the disease is decreased.

Sushruta points out that the primordial symptoms of fatigue; weakness and general malaise are indications of loss or waste of *ojas*. In the next verse he clearly explains that when *ojas* has been dislodged from its natural seat and has become vitiated, the

medical treatment should consist of improving *ojas* by elixirs and remedies that increase *ojas*. [20]

*Ojas* according to 'Yoga of Herbs', is that which invigorates, the essence of the body; the substance of all hormonal secretions and that which supports the autoimmune system. Tools to strengthen *ojas* are right diet for one's constitution, *satvic* lifestyle and all *rasayana* therapies.

According to Dr. Frawley, diseases like immune system or endocrine dysfunction may be more related to *prana tejas* or *ojas* issues than *kapha, pitta* or *vata*. "The inner levels of treatment are more important than the outer. They are more universal and less complex but require a more active role and participation on the part of the patient. They require a change of lifestyle and thought and the adaptation of some spiritual practice". [21] With this approach, the responsibility of managing a disease is in the hands of the patient and with greater self awareness, the symptoms and imbalance are more effectively addressed than by a blood test every few months.

## Diet

Diet is one of the main pillars of health, and herbs cannot be effective for a patient who does not observe a strict regiment of diet. Hence specific guidelines as to what foods to eat and avoid, pacifying the aggravating *dosha*, is the cornerstone of ayurvedic treatment. One should eat foods that are suitable to their *prakruti* and those that will balance *vata-kapha vikruti* while eliminating *ama*, rekindling *agni* with spices that have *dipana* and *pachana* actions. Once *ama* is cleared, focus should be on *satvic* foods that build *ojas*. Uncooked goitrogenic foods, soy products and excess of any one food should be avoided.

According to ayurvedic texts, goitre does not strike those who take milk in adequate quantities. In addition, old rice, barley, moong dal, bengal gram, cucumber, sugar juice,

and milk products are recommended for a goitre patient. Sour and heavy substances are contraindicated.

Interestingly drinking water stored overnight in a copper cup is believed to improve metabolism according to my ancestors.

## *Yoga*

In his book, '*The yogic management of common diseases*', Dr Swami Karmananda writes: "Long before medical science ever knew about the existence of thyroid glands, the yogis had devised practices which not only maintained healthy glands and metabolism, but also formed part of a system of enlightenment. The good health of the neuroendocrine system is understood to be vital to higher awareness".

Yoga stimulates and normalizes the function of the thyroid, pituitary, pineal and adrenal glands. It limbers and stretches the neck, as well as strengthens and tones the nervous system. The *asanas* specific for thyroid health are: *Sarvangasna* which puts considerable pressure on the thyroid, improving circulation and squeezing out stagnant secretions, *Matsyasana*, *Halasana*, *Surya Namskara*, *Naukasana*, *Uttanpadasana*, *Yashtikasana*, *Pavanmuktasana*, *Suptavajrasana* and all forward and backward bending *asanas*.

## *Pranayam*

Deficient flow of energy through the *nadis* manifests as hypoactivity of mind, fatigue and dullness of senses. There are 72000 *nadis* in the subtle body. Of these, *Pingala* with its energy of the sun, and *Saraswati nadi* branching out from the throat chakra supplying *prana* to the mouth and throat area are of importance to the thyroid. *Pranayam* techniques that focus on these *nadis* are *suryabhedan* (solar breathing) and *anulom vilom* (alternate nasal). *Suryabhedan* (Solar) *pranayam* is energizing and stimulates the sympathetic nervous system; it is great for all hypo conditions

particularly in *vata-kapha* conditions. Alternate *pranayam* brings a harmony between the parasympathetic and the sympathetic nervous system, a balance between the accelerator and the brake. *Nadi shodhana* is useful in rebalancing metabolism. *Ujjai* (victory or oceanic breath) is however, the most effective for thyroid problems as it relaxes and stimulates the *vishudha* chakra and when done with *jalandhara bandha*, it squeezes out toxins and brings in powerful healing *prana* to the thyroid.

During *pranayam* practice, one can visualize the channels in the body and direct the flow of *prana* through the *sushumna* and into the *vishudha* chakra, while chanting the mantra "hum" to bring in healing energy of sound, *prana* and meditation. Mantras are highly significant in a spiritual practice as they energize the healing process and balance *prana*, *tejas* and *ojas* while clearing impurities from the *nadis*. Using the mantra 'Om', the most important and empowering mantra, is also believed to increase *ojas* as it awakens the positive life force within for healing to occur. 'Som' is another mantra that is good for rejuvenation as it increases vitality, joy and *ojas*.[22] Performing *nasya* is prescribed in *dinacharya* along with *neti* and it is worth doing these practices before *pranayam*. In fact a *nasya* with calamus or other herbs specified below for thyroid stimulation may be even better.

## *Mudras*

*Pranayam* is often done with specific *mudras* and in the practice of yoga, *mudras* are very important in their influence on the flow of healing energy of *prana* in the subtle and physical body. Swami Ramdev suggests these *mudras* in particular: surya *mudra*, *prithvi mudra* and *prana mudra*. Others that may benefit are *pashinee mudra*, *vipareeta karani mudra* and *yoga mudra*.

*Pranayam* prepares the mind for meditation and here lies the path to remembering one's divine nature. Many forms of meditations can be explored, depending on the

experience and nature and belief system of the patient. Whether using a mantra, or a specific technique, using positive affirmations along with meditation, can be highly empowering in the healing process. Author Louise Hay sees thyroid disease as expressing a helpless attitude of giving up and feeling hopelessly stifled. She suggests creating new thought patterns with healthy affirmations such as: "I create a new life with new rules that totally support me." Or "I move beyond old limitations and now allow myself to express freely and creatively."

Accupressure is yet another method of curing disease with the idea that all the main centers of the nervous system and glands are located in the palms and soles of the feet. Applying pressure on these specific points in the palm or soles sends energy to the corresponding gland or organ. The area at the base of the thumb and along the edge of the palm and on the soles of feet and the area between the big toe and the 2nd toe are believed to stimulate the thyroid according to Dr. Atar Singh in "Natural Acupressure Treatment".

## Aromatherapy

Geranium Essential Oil is known to help regulate thyroid hormone. Tea Tree oil is recommended to stimulate the *vishudha chakra* while rose, bergamot jasmine, neroli and many other aromatic oils calm and strengthen the immune system and *ojas*. Aromatic oils help clear and cleanse both the mind and life force, cleanse and open the channels and chakras, clear and strengthen the aura and build *satva*. Aromas work primarily on *prana*, directly stimulating the life force in the body and promoting healing on all levels. Lavender, rose, sandalwood and saffron are identified for their benefit on increasing *ojas*.

## Color Therapy

Colors help strengthen the aura and astral body and are considered very useful in subtle and spiritual healing. *Satvic* colors are white, gold, blue, green, light yellow,

coral, and all pastels. For increasing *ojas*, gold and brown are specified. Gold in particular strengthens the immune and endocrine systems

## Herbal *Chikitsa*

Dr. Vasant Lad explains that the thyroid's function in metabolism relates to *agni* both within the gland as the T3 and T4 hormones and at the cellular level as it kindles the *agni* within the cells.[15] Based on this understanding, *deepana*, *pacahana*, *ushna*, *teekshna*, *sukshma*, *lekhana* herbs which pep-up body metabolism would be beneficial.

Based on centuries of use and now recent clinical data, herbs such as *ashwagandha* (withania somnifera),[23] *brahmi* (bacopa monnieri),[24] *guggul* (the gum resin of commiphora mukul), [25,] *Kanchanara* (Bauhinia veriegata and B.tormentosa and B.purpurea) [27] and others such as *shilajita* (Asphaltum puniabiunum), skullcap (Scutellaria), *gokshura* (Tribulus terrestris ), *punarnava* (Boerhaavia diffusa) and *jatamansi* (Nardostachys *jatamansi*) have proven very useful in the treatment of hypothyroidism.

It is interesting how these herbs can be so specific in the way they address the hormonal imbalance. For instance, with reference to *ashwagandha*, researchers S. Panda and A. Kar have proved its importance in the regulation of thyroid function to enhance serum T4 concentration and increase hepatic glucose-6-phosphatase (G-6-Pase) activity and antiperoxidative effects. They indicate that *ashwagandha* root powder possesses free radical scavenging activity, which may be responsible for its pharmacological effects. In the case of the thyroid stimulating potential of *brahmi* and *guggulu*, recent research work done by Dr. Tripathi and others have revealed that *guggul* increases the conversion T4 to T3 through increasing thyroid proteolytic activity and the uptake of iodine into thyroxin, and without increasing TSH.[26]

Besides single herbs, there are also many formulas that have been studied and are used safely and effectively for managing hypothyroid conditions including *Kanchanar Guggulu*, *Mahayogaraj guggulu*, *ashwgandharishta*, *chandra prabha* and *triphala*.

Over thousands of years ago, these very herbs were identified for their rejuvenating properities as *rasayana* herbs, to rebuild the body, mind, prevent decay and postpone and reverse the aging process. These herbs are more than just nutritive tonics; most are adaptogens and non toxic in normal dose. *Rasayanas* and adaptgens are anti inflammatory, antioxidant, anxiolytic (mildly tranquilizing), antidepressant, nervine, and amphoteric ( help the body maintain homeostasis). While *rasayanas* work on the whole body and the major systems such as immune and digestive, research by A. Panossian [35] postulates that adaptogens specifically affect the Hypothalamic, Pituitary and Adrenal axis and the Sympathoadrenal System.

Applying this ayurvedic principle of knowing the exact nature of the herbs, many practitioners are now beginning to identify other *rasayana* and adaptagenic herbs for very specific conditions like hypothyroidism.

Rob Talbert CAS has seen sucessful results in his practice with the Chinese tonic herb polygonum multiflorum (*fo ti or ho shou wu*) for its capacity to ameliorate hypothyroidism. Traditionally this herb has been widely used to restore vitality and virility, working especially on the liver, the reproductive, urinary and circulatory systems. Evidence from studies now indicate that prepared *Ho Shou Wu* has neuroprotective effects inhibiting the formation of beta-amyloid plaques (which are associated with neurodegeneration in people with Alzheimer's disease), and prevent dopaminergic degeneration caused by toxic pesticide exposures while improving mental acuity and recall. Most importantly, regular use of *Ho Shou Wu* has promoted increased adrenal and thyroid hormone secretions, enhanced T lymphocyte and macrophage activity, and prolonged the life spans of various animals. [36] In his book, *Adaptogens,*

*Herbs For Strength, Stamina, and Stress Relief*, [37] Winston recommends combining *He Shou Wu* with *ashwagandha* to enhance the thyroid stimulatory effects.

Maca (lepidium meyeni) is another promising option. This South Amercian herb promoted by herbalist Dr. Viana Muller has given remarkable results and even cured hypothyroid patients. Coleus forskolli or Forskolin has been selected by Dr Ward Dean for its ability to increase production and secretion of thyroid hormones. Based on the findings of these studies, adaptogenic and *rasayana* herbs can be very effective in stimulating thyroid function because of their natural antioxidant potential and because they strengthen the body's defense system. The herbalist Karta Purkh Singh Khalsa believes that the objective for any chronic disease such as thyroid disease is to provide overall support for the immune system herbally, and then provide support to the targeted organ – in this case the thyroid using herbal medicine. He describes the interplay of hormones as a "symphony," and "by working on the whole system, an expert can get all the glands come into play."

The first line of treatment of any disease is to reverse the *nidana*. With the many possible causes that were discussed earlier, being able to identify a specific cause can make it easier to select the right herbs to treat the imbalance. If the cause of hypothyroidism is understood to be from low iodine intake from food or uptake at the thyroid level in the body, sea weeds like bladderwrack (Fucus vesiculosus) or kelp (Laminaria digitata, L. japonica, L.hyperborean) can be beneficial as they contain organically bound iodine. Iodine rich *Shigru* (Moringa Oleifera Lam) [28] and *Jalakumbhi* (Echolornia crassipes) have also been used in studies and proven to increase thyroid hormone production by treating the iodine deficiency.

Dr. Vijaya Lakshmi Prasuna at the Govt. Ayurvedic College in Hyderabad has specified the following guidelines for herbal chikitsa: If hypothyroidism is due to an autoimmune

disease, *Jeevanaparvantam* is suggested with immuno modulatory herbs (*rasayana* herbs). If it is related to a selenium deficiency which can impair the conversion of T4 to T3 process, the herb *pippali* (Piper Longum - another *rasayana* herb) increases the absorption of selenium. If the problem lies at hypothalamo -pituitary level: anti stress herbs, *medhya rasayana* herbs, and *nasya* karma may be beneficial. At thyroid gland level, thyroid stimulatory herbs mentioned earlier would be beneficial.

## List Of Herbs For Hypothyroidism

Depending on the nature of the patient, the specific qualities of the herbs, the exact nature of the symptoms and the cause of the disease, any one or a combination of the following herbs that have been used safely for thousands of years and now scientifically validated for stimulating the thyroid may be used:

- *Ashwagandha* (withania somnifera).
- *Brahmi* (bacopa monnieri).
- *Guggul* (commiphora mukul).
- *Kanchanara* (Bauhinia veriegata and B.tormentosa and B.purpurea).
- *Shilajita* (Asphaltum puniabiunum).
- Skullcap (Scutellaria).
- *Gokshura* (Tribulus terrestris ).
- *Punarnava* (*Boerhaavia diffusa*).
- *Jatamansi* (*Nardostachys jatamansi*).
- Polygonum multiflorum (*fo ti* or *ho shou wu*).
- *Maca* (lepidium meyeni)
- Coleus forskolli
- *Pippali* (Piper Longum)
- *Shankhapushpi* (*Evoluvus alsinodes*)
- *Kanchanara guggul*

## Thyroid Boosters And Herbs To Avoid

There are countless products available on the market today that promise a cure for hypothyroid patients, however without knowing the source, specific qualities, concentration of every ingredient in the formula and how they will react in a particular individual's body, efficacy of these products are highly questionable and all possible risks need to be considered. There is a caution - overdosage of herbs in isolated cases (albeit with improper usage ) have resulted in adverse effects. It is also interesting that herbs can be very specific and without a thorough understanding, using them medicinally, can be detrimental.

Even these commonly used herbs such as Momordica charantia (bitter gourd or *karela*), [29] fenugreek seeds, [30] ocimum sanctum (*tulsi*),[31] betel leaf (*paan*) [32] and *neem* (Azardirachta indica) [33] have shown anti-thyroid activities. These can induce alterations in both T4 at the level of the thyroid gland and T3 at the level of the liver, so they may be better suited for hyperthyroidism.

## Conclusion and Summary

Any comparison between allopathy and ayurveda is going to be limited because of the differences in understanding of cause, purpose and process of treatment and use of language and concepts which are very specific to one or the other perspective. Defining concepts like perfect health in psychospiritual terms as being firmly established in the Self, life force as *prana*, deep within the subtle layers of the body and the quality of the state of awareness, are outside the field of scientific study. Yet in ayurveda, they are at the very core of man's physical, emotional and spiritual well being. However putting these differences aside, the union of the two can be a catalyst in bringing total health and bliss to those suffering from a chronic disease like hypothyroidism.

Thyroid homeostasis is a delicate balance, and hormone replacement drugs, food supplements and herbs that affect thyroid function should be carefully monitored by a medical doctor, preferably someone who is open to a more holistic approach. Keeping in mind that an accurate diagnosis and replacing the hormones at just the right amount to correct the deficiency is crucial, however to continue with the same lifestyle that may have contributed to the disease is to miss the opportunity for improving health of the body and mind and for spiritual growth.

Ayurveda reminds us that the goal is not simply to cure a disease, the real aim is to reach a higher state of consciousness "*yogas chitta vritti nirodhah* " yoga *sutras* 1-2 Health is a basis for greater self understanding, to remember our true nature and live in harmony with one's *svadharma*. Dr. Marc Halpern clearly states that, "The challenges each person faces only reflects the evolution of the soul and the person's accumulated karma. Each person's challenges are perfect for that person and give that person the opportunity to dissolve the karma binding the soul by learning the lesson the challenge brings with it", hence "These challenges are perfect for helping the individual to increase his or her awareness and the connection to God". [34]

Ultimately, the role of the ayurvedic practitioner is one of an educator or a facilitator, guiding the patient to connect with their own spiritual energy, and take a greater responsibility for their health. It is not enough for a practitioner to know the patient well and to improve the health. What is more important is that the patient knows themselves well and how to improve their health and to use tools that ayurveda offers to improve their health. Hence education is more important than the actual treatment in preventing and managing any disease.

With reference to managing hypothyroidism and seeing that it is about increasing *satva* and rebuilding *ojas* by applying the necessary ayurvedic guidelines to daily living, the lessons that will be learnt along the way will not only relieve the symptoms of the

disease and improve the quality of life, but also and more importantly, remind them of their divine nature while guiding them to discover and live their true purpose.

om pūrṇamadaḥ pūrṇamidaṁ pūrṇātpūrṇamudacyate
pūrṇasya pūrṇamādāya pūrṇamevāvaśiṣyate

ॐ पूर्णमदः पूर्णमिदं पूर्णात्पूर्णमुदच्यते ।
पूर्णस्य पूर्णमादाय पूर्णमेवावशिष्यते ॥

That is full, this also is full.
This Fullness came from that Fullness.
Though this Fullness came from that Fullness,
That Fullness remains forever full.

om: sacred syllable often at the commencement of prayers
pūrṇam: full, perfect
adas: that
idaṁ: this
pūrṇāt: from fullness
udacyate: subsequently, comes from
pūrṇasya: of fullness
ādāya: taking
eva: certainly, still
avaśiṣyate: remains

*Shantipath, Ishavasya Upanishad*

# BIBLIOGRAPHY

AACE Medical Guidelines for Clinical Practice for the Evaluation and Treatment of Hyperthyroidism and Hypothyroidism. Endocrine Practice, Vol. 8, No. 6, Nov/Dec 2002.

Cakir M, Samanci N, Balci N, Balci MK. Musculoskeletal manifestations in patients with thyroid disease. Clin. Endocrinol (Oxf). Aug 2003.

Frawley, Dr David, Lad, Dr Vasant. The Yoga Of Herbs. 2nd ed. Lotus press, 2001.

Frawley, Dr David. Ayurvedic Healing Course. Vol. 1-4 New Mexico: American Institute of Vedic Studies, 2004.

Halpern, Dr Marc. Principles of Ayurvedic Medicine. Vol. 1-2. 9th ed. CCA.

Kar A, Panda S. Ayurvedic therapies for thyroid dysfunctions In Scientific Basis for Ayurvedic Therapies, Mishra L (ed.), CRC Press: Boca Raton, FL. 2003

Lad, Dr Vasant. Textbook of Ayurveda. Vol. 1. Albuquerque: The Ayurvedic Press, 2002.

Mishra, L. Scientific Basis for Ayurvedic Therapies. (ed.), CRC Press: Boca Raton, FL, 133–148.

Ramdev, Swami. Yog, It's Philosophy and Practice. 2nd ed. Hardwar, India: Divya Prakashan, 2007.

Caraka Samhita. Translated by Sharma, R.K., Dash, Bhagwan. Chaukhambha Sanskrit Series, Varanasi, India, 1992.

Ashtang Samagraha. Translated by Srikantha Murthy, Prof. K.R. Krishnadas Academy, Vanarasi, India, 1994.

Sushruta Samhita. Translated by Chaukhambha, Orientalis, Varanasi, India, 1992.

Shomon Mary. Living well with Hypothyroidism. HarperCollins Publishers; February 2005.

Winston, D., Maimes, S. Adaptogens, Herbs For Strength, Stamina, and Stress Relief, Healing Arts Press, 2007.

# REFERENCES


[1] McGwin, Dr Gerald, Iwach, Dr Andrew, British Journal Of Opthalamology online, Oct 2008.

[2] Doerge Dr, Goitrogenic and estrogenic activity of soy isoflavones, Environ Health Perspect. June 2002; 110 suppl 3:pp.349-53.

[3] Blount, Benjamin C. Environmental Health Perspectives: Urinary Perchlorate and Thyroid Hormone Levels in Adolescent and Adult Men and Women Living in the United States. Environmental Health Perspectives Branch (EHPB), National Institute of Environmental Health Sciences, National Institutes of Health, U. S. Department of Health and Human Services. October 2006.

[4] Scorecard Pollution Information Site
http://www.scorecard.org.

[5] Prasad A. Clinical, biochemical and nutritional spectrum of the zinc deficiency in human subjects. NTR RE 41 1983; pp.197-208.

[6] Yamamoto Naika, Chuo-ku. Tablet formulation of levothyroxine is absorbed less well than powdered levothyroxine. Osaka, Japan.PMID: 14751040 PubMed - indexed for MEDLINE.

[7] Bolk N, Visser TJ, Kalsbeek A, van Domburg RT, Berghout A. Effects of evening vs morning thyroxine ingestion on serum thyroid hormone profiles in hypothyroid patients. Clin Endocrinol (Oxf). Pubmed Jan 2007; 66(1):pp.43-8.

[8] Benvenga S, Bartolone L, Squadrito S, Lo Giudice F, Trimarchi F. Delayed intestinal absorption of levothyroxine. Thyroid Pubmed Aug 1995; 5(4):pp.249-53.

[9] Benvenga S, Bartolone L, Pappalardo MA, Russo A, Lapa D, Giorgianni G, Saraceno G, Trimarchi F. Altered intestinal absorption of L-thyroxine caused by coffee. Thyroid Pubmed March 2008; 18(3):pp.293-301.

[10] Singh N, Weisler SL, Hershman JM. The acute effect of calcium carbonate on the intestinal absorption of levothyroxine. Thyroid Pubmed Oct 2001; 11(10):pp.967-71.

[11] Liel Y, Harman-Boehm I, Shany S, Evidence for a clinically important adverse effect of fiber-enriched diet on the bioavailability of levothyroxine in adult hypothyroid patients. J. Clin. Endocrinol. Metab., Feb 1996; 81: pp.857-859.

[12] Shakir KM, Chute JP, Aprill BS, Lazarus AA. Ferrous sulfate-induced increase in requirement for thyroxine in a patient with primary hypothyroidism. South Med Journal. June 1997; 90(6):pp.637-9

[13] John-Kalarickel John, Pearlman Gwen, Carlson Harold, Thyroid, August 2007; 17(8): pp.763-765. doi:10.1089/thy.2007.0060.

[14] Caraka Samhita, Vimansthana, ch2, verses 8-9.

[15] Lad, Dr Vasant. Textbook of Ayurveda. Vol. 1. Alburquerque: The Ayurvedic Press, 2002; p.97.

[16] Caraka Samhita, Sutrasthana, Vol. 1, ch8, p.345 verses 44-47.

[17] Caraka Samhita, Sutrasthana, Vol. 1, ch11 verse 49.

[18] Sushruta Samhita, Nidanastana, ch11.

[19] Halpern, Dr Marc, Principles of Ayurvedic Medicine, ch7, p.10.

[20] Sushruta Samhita, Sutrasthana, ch15, p.244, verses 25-28.

[21] Frawley, Dr David. Principles of Ayurveda Part I. p.129.

[22] Frawley, Dr David. Ayurvedic healing course for health care professionals. Vol. 4, p.126.

[23] Panda S, Kar A. Withania somnifera and Bauhinia purpurea in the regulation of circulating thyroid hormone concentration in female mice. J Ethnopharmacol 1999a; 67: pp.233–239.

[24] Kar A, Panda S, Bharti S. Relative efficacy of three medicinal plant extracts in the alteration of thyroid hormone concentrations in male mice. Journal of ethnopharmacology 2002; 81(2):pp.281-5.

[25] Panda S, Kar A, Guggulu Commiphora mukul induces triiodothyronine production: possible involvement of lipid peroxidation. Life Sci 1999; 65:pp.137–141.

[26] Tripathi YB, Malhotra OP, Tripathi SN. Thyroid stimulating action of z guggulsterone obtained from commiphora mukul. Planta Med 1984; 54:pp.271-277.

[27] Clinical studies by Panda and Kar at Thyroid Research Unit, D.A. University, Indore, India.

[28] Prasuna, Dr. Vijaya Lakshmi. Thesis - Clinical study on the effect of kanchanara guggulu and shigru patra kwath on hypothyroidism Dept of Kaya Chikitsa ,Dr. BRKR Govt. Ayurvedic College, Hyderabad.

[29] Panda S, Kar A. Excess use of momordica charantia extract may not be safe with respect to thyroid function and lipid peroxidation. Current Science July 2000; 79.2: pp.222-24.

[30] Panda S; Tahiliani P; Kar A. Inhibition of triiodothyronine production by fenugreek seed extract in mice and rats. Pharmacological research : the official journal of the Italian Pharmacological Society 1999; 40(5):pp.405-9.

[31] Panda S; Kar A. Ocimum sanctum leaf extract in the regulation of thyroid function in the male mouse. Pharmacological research : the official journal of the Italian Pharmacological Society 1998; 38(2):pp.107-10.

[32] Panda S; Kar A. Dual role of betel leaf extract on thyroid function in male mice. Pharmacological research. Journal of the Italian Pharmacological Society 1998; 38(6):pp.493-6.

[33] Panda, S, Kar A. How safe is neem extract with respect to thyroid function in male mice? Bio info bank library. Apr. 2000. http://lib.bioinfo.pl/pmid:10704265.

[34] Halpern, Dr Marc, Principles of Ayurvedic Medicine, Vol. 2, p.281.

[36] Dharmananda, Ph.D, Subhuti. HO-SHOU-WU. Thesis. Institute for Traditional Medicine, Portland, Oregon, June 1998. http://www.itmonline.org/arts/hoshouwu.htm>.

[35] Panossian A. G. Adaptogens, Tonic herbs for fatigue and stress. Alternative And Complimentary therapies. 2003. Vol. 9, No.6, pp.327-332.

[37] Winston, D., Maimes, S., Adaptogens, Herbs For Strength, Stamina, and Stress Relief, Healing Arts Press, 2007.

## INTERNET RESOURCES

American Association of Clinical Endocrinologists
http://www.aace.com/

American Thyroid Association.
http://www.thyroid.org/index.html

American Thyroid Association.
http://www.thyroid.org/patients/brochures/Hypothyroidism%20_web_booklet.pdf

Arangi, Sareh. Thyroid gland World Book Advanced
http://www.worldbookonline.com/advanced/article?id=ar556900

Endocrineweb
http://www.endocrineweb.com/

NIH and US dept of health and human services. Hypothyroidism. National Endocrine and Metabolic Diseases Information Service. June 2008.
http://www.endocrine.niddk.nih.gov/pubs/Hypothyroidism/Hypothyroidism.pdf

The Mayo Clinic
http://www.mayoclinic.com/

US National Library Of Medicine
http://www.ncbi.nlm.nih.gov/pubmed/18341376?dopt=Citation