

Herbal and Nutritional Therapeutics for Autoimmune Hypothyroidism

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Hashimoto's Autoimmune Hypothyroidism

Autoimmune Hypothyroidism, also known as “Hashimoto's”, is the most commonly diagnosed autoimmune disease. Hashimoto's affects approximately 2% of the population (Farhangi et al.) and makes up 85% of all thyroid disease (Bergner). Conventional medical approaches are typically able to stabilize thyroid hormones, but often people with Hashimoto's using conventional approaches still experience symptoms and have the disease for life with no remission. It is possible using natural herbal and nutritional approaches for people with this disease to experience a higher quality of life and normalization of thyroid hormones. Utilizing herbs, nutrition and food allergen elimination can be an effective strategy for reducing symptoms, normalizing thyroid hormones and reducing thyroid antibodies.

How does the thyroid work?

The thyroid gland is a butterfly shaped gland located in the front of the neck. It wraps around the windpipe. In Greek the word “thyroid” stems from the word “shield”. There are two lobes to the thyroid gland. If one is damaged the other gland can take over function (Christianson et al. 4). The thyroid is a highly-vascularized organ. Follicles surround tissue called a colloid, which contains Thyroglobulin, a protein that makes up a large portion of the thyroid gland (Hazzard, 3). The Thyroid gland is responsible for making hormones that regulate the energy center in cells. Each cell in the body has “mitochondria”. Mitochondria produce energy called adenosine triphosphate (ATP). ATP is responsible for powering the cell. This makes the thyroid essential for making sure that energy, growth and reproduction of the cells are working properly

throughout the entire body. All the organs and tissues within the body are dependent on the cells appropriately regulating energy production in order to function properly (Christianson et al, 6-7). Mitochondria utilize glucose (sugar from food) and convert the sugar into ATP, this is what energizes the cell. The thyroid hormone is responsible for regulating how much or how little ATP needs to be produced. When energy is needed the Hypothalamus sends a signal to the pituitary gland telling it to produce Thyroid stimulating hormone or TSH. TSH then stimulates the thyroid to produce thyroid hormones. Ultimately the Hypothalamus sets the energy level of the cells, but the thyroid hormone is necessary for making this possible (Christianson et al, 6-7). Thyroid hormone is made by combining Tyrosine and Iodine. The hormones are made in two steps. First the Tyrosine is converted to Thyroglobulin. Thyroglobulin is a hormone that binds to iodine. Iodide is taken in to the body through water or food and is converted into organic iodine through a reaction with an enzyme called Thyroid peroxidase (Hazzard, 3). The Thyroglobulin molecule is combined with 4 iodine atoms, this is what makes T4 thyroid hormone. T4 makes up 80-90% of the hormones made by the thyroid gland. T4 is a storage form of thyroid hormone and is designed to preserve the iodine until it is needed. When energy is needed an enzyme called deiodinase type 1 takes a single iodine atom off of the T4, which converts T4 into T3 (only having 3 iodine molecules). The T3 is necessary for giving energy to the mitochondria. T4 circulates in the blood until needed to make T3. T4 stays potent longer than T3, making it more efficient. The thyroid gland is also able to make T3 directly, but this only makes up about 10% of the hormones the thyroid gland produces. The thyroid gland also produces T1 and T2 hormones, these make up roughly 4% of the hormones produced by the thyroid (each having the corresponding number of iodine atoms). T2 was recently discovered to play a role in metabolism and fat burning and may be useful in converting T3 to T4. It still is not clearly understood what

role T1 plays. Reverse T3 is created when the body needs to get rid of T4. When there is too much T4 in the blood it is disposed of by the removal of an iodine atom, making “reverse T3” and then is excreted from the body (Christianson, 10-12). Free T3 and T4 are freely circulating hormones, not bound to any proteins or being currently used in tissues (Hazzard, 3). Conversion of T4 to T3 is promoted by Growth Hormone (Bergner).

Hypothyroidism

A person is considered “hypothyroid” when the thyroid is not making enough T4 or T3. Hypothyroidism makes up about 80% of thyroid disease and most hypothyroidism is autoimmune in nature. When there is not enough T4 or T3 the mitochondria are not able to convert as much glucose into ATP. This can cause a variety of symptoms that affect the entire body (Christianson et al. 12).

Through unknown mechanisms, but possibly a result of high levels of inflammation the body begins to make antibodies to either thyroid peroxidase (the enzyme responsible for conversion of iodide into iodine) or Thyroglobulin. Thyroid peroxidase antibodies are typically referred to as “TPO antibodies” and antibodies to Thyroglobulin are typically referred to as “Tg antibodies” (Christianson et al. 62). The presence of antibodies is what distinguishes autoimmune hypothyroidism (Hashimoto’s) from other forms of hypothyroidism (such as hypothyroidism caused by iodine deficiency).

Autoimmune thyroid disease, or Hashimoto’s, is characterized by hyperactive B and T lymphocytes and the presence of antibodies. B cells are responsible for antibody production. There are many different types of T cells, T cells are involved in creating specific immune responses. It is thought that a T lymphocyte subset imbalance could play a role in inflammation

of the thyroid and Hashimoto's. T lymphocyte subsets play a critical role in regulating the immune system. CD4+ cells are a type of T helper cell and are involved in assisting white blood cells. CD8+ cells are cytotoxic or T suppressor cells. These cells are activated by B plasma cells. B plasma cells are responsible for creating antibodies. A decrease in the CD4+/CD8+ ratio has been observed in Hashimoto's. It is thought that the increased level of CD8+ cells could be directly responsible for the destruction of thyroid tissue and thyrocytes. CD8+ cells have cytotoxic properties and can cause thyroid epithelial cell hyperplasia and fibrosis (He et al. 5, 7). There is evidence that the increased CD4+ and CD8+ cells could be responding to viral activity within the thyroid. In a study on the prevalence of the HHV-6 Viruse (Human Herpesvirus 6) it was found that virus specific CD4+ and CD8+ cells were higher in participants with Hashimoto's. These cells were responding specifically to a protein presented by thyroid cells as an antigen in HHV-6. In the study, Hashimoto's patients showed a much higher level of these CD4+ and CD8+ cells than control subjects that had tested positive for HHV-6 but did not have Hashimoto's (Caselli, et al. 5).

Cytokines are pro-inflammatory molecules that regulate systemic inflammatory responses. They modulate development and growth of thyroid cells and play a large role in autoimmune hypothyroidism (Stazi et al. 6). IL-15 is a specific inflammatory cytokine that has been found to be over expressed in Hashimoto's and has been shown to induce the expression of other inflammatory cytokines involved in autoimmune disease in general. C-Reactive protein (a marker of inflammation) is normally elevated in Hashimoto's. The thyroid gland is covered in a fibrous sheath that may permanently develop permeability or erosion due to inflammation. This may be a trigger of autoimmunity (Bergner).

Symptoms

The symptoms of hypothyroidism are very broad. Because mitochondria are present in every cell, the entire body is affected. Symptoms may seem vague and unconnected. Most people experience some variation of uncontrolled weight gain or difficulty in losing weight, fatigue, exhaustion or sluggishness, brain fog, depression, anxiety, insomnia, irregular menstrual cycle, infertility, dry skin and hair, low sex drive, water retention, sensitivity to cold, numbness in hands and feet, muscle weakness, low stamina and an enlarged neck. Some people experience multiple symptoms and some experience very few symptoms (Christianson et al. 21-32).

Goiters may be a symptom that is developed in cases of hypothyroidism. A goiter develops when the thyroid gland swells. This is often visible swelling in the front of the neck in front of the Adam's apple. Goiters are caused by the thyroid gland enlarging in response to increased levels of TSH. When the thyroid is not capable of producing hormones it enlarges to create more cells to make hormones. With an autoimmune disease like Hashimoto's the new cells are incapable of creating more hormones (Christianson et al. 66). One of the factors thought to perpetuate goiters and thyroid enlargement is VEGF (vascular endothelial growth factor). This is a glycoprotein that is potentially responsible for vascularization and enlargement of the thyroid gland. VEGF receptors are located inside the epithelial cells of the thyroid and regulate the development and function of these cells. It is stimulated by TSH. When TSH is increased the VEGF receptors are stimulated and cause growth and increased vascularization of the thyroid in order to try and promote increased thyroid hormone production. VEGF is also stimulated by thyroid cancer cells (Farhangi et al.).

Diagnosis

Hashimoto's is best diagnosed using a full thyroid panel. This means testing TSH, T4, T3 and thyroid antibodies (both TPO and Tg). Some practitioners rely entirely on the TSH test.

However, this is not always accurate. The TSH level represents a 2-3 month average of thyroid activity. It is also possible with Hashimoto's to swing between hypo and hyper (over active) thyroid in the beginning stages of the disease, so the TSH may appear to be normal. This is also not always accurate because it does not show whether your cells are receiving adequate amounts of T3 in order to make the energy they need. TSH levels can vary dramatically throughout the day, up to 50% (Bergner). A test for T4 levels and T3 levels is a more accurate depiction of what is available for the cells to use. Free T3 and T4 can be tested to show how much is circulating in the blood. Measuring Free T3 will show how much active thyroid hormone is available to the cells. If there is a lot of T4 but not much T3, it may be suggestive of an issue of converting T4 into T3. The test that confirms whether hypothyroidism is in fact autoimmune in nature is an antibody test. A test for TPO (thyroid peroxidase) or thyroglobulin (Tg) antibodies can be run. In Hashimoto's levels of either one or both antibodies will be higher than normal (Christianson et al. 91). Many people with antibodies do not ever develop hypothyroidism.

It was discovered by Dr. Broda Barnes that people with hypothyroidism experienced a low basal temperature in the morning. He used this as a diagnostic technique when evaluating patients for hypothyroidism. He considered 97.8 degrees Fahrenheit or below as a normal basal morning temperature to be evidence of hypothyroidism. This is due to the slowed metabolism resulting in a lower body temperature (Christianson et al. 37).

Because many autoimmune diseases have similar symptoms, it can be necessary to test for other autoimmune diseases as well. It is also possible that once the body begins to demonstrate autoimmune tendencies that other autoimmune disease may develop. It is not uncommon for a person with an autoimmune disease to develop other autoimmune diseases (Christianson et al. 66).

Contributing factors in Hashimoto's hypothyroidism

There are many factors that are thought to contribute to Hashimoto's hypothyroidism, some of which are thought to contribute to autoimmunity in general and some more specific to Hashimoto's. It is unknown whether most of these factors actually cause Hashimoto's or just exacerbate the disease. The cause of Hashimoto's is thought to be multi-factorial with potential genetic factors.

Toxins

Because the thyroid sifts through the blood looking for iodine, the thyroid is sensitive to chemicals and environmental toxins. The thyroid gland finds and stores iodine from the blood. Because of this it also finds and stores chemicals similar to iodine (Christianson et al. 63). There are several chemical substances which are molecularly similar to iodine and may be absorbed by the thyroid. Mercury and Perchlorate are common substances taken up by the thyroid due to their similarity in structure to iodine. Chemicals come into the body through pesticides, water, processed foods, cosmetics, etc. Over time they can accumulate and cause an adverse reaction by the immune system. The immune system may create antibodies to these toxins and because the thyroid takes these toxins in mistaking them for iodine, these antibodies may begin to attack the thyroid gland (Christianson et al. 15). There is some speculation that it may be helpful for people to have Amalgam mercury fillings removed from their teeth. Several of the presenters of the online Thyroid summit agreed that toxic chemicals may play a role in thyroid disease. Dr. Amy Myers believes that Chloride, Fluoride and Bromine, common chemicals in modern life are

responsible for displacing iodine and contributing to thyroid disease. She also believes that toxic mold could contribute to thyroid dysfunction. Dr. Perlmutter also mentions that fogging campaigns to get rid of mosquitos are known to have a negative effect on thyroid health and endocrine function (Thyroid summit presentation).

Iodine induced hypothyroidism occurs when too much iodine is ingested. When there is too much iodine in the body there is the potential for too many thyroid hormones to be made. Too many thyroid hormones can result in a condition called “thyroid storm” which can be fatal. Because of this the body shuts off the thyroid from producing hormones when there is too much iodine available. Antibodies to iodine may be created and will attack both iodine and the cells of the thyroid. This can be avoided by staying within the daily recommended amount of 150-300 mcg of iodine/day (Christianson et al. 70-71). Dr. Mark Hyman recommends staying away from iodized salt entirely (Thyroid summit presentation). In two separate countries studies were conducted on thyroid disease after potassium iodide was added to salt. In Slovenia researchers studied the incidence of Hashimoto's thyroid disease for 10 years after the introduction of potassium iodide in the salt. They found that the incidence of Hashimoto's diagnosis doubled in that period. They did find that the incidence of goiter did decrease, but that autoimmune Hashimoto's increased substantially (Zaletel, Gaberscek, Pirnat, 1-3). Another study in China showed similar results when comparing two villages. One with adequate iodine intake and another with above adequate iodine intake due to both iodized salt and natural iodine in the water. In the “above adequate” village a higher level of Hashimoto's and thyroid antibodies were noted. Paul Bergner cites a study, Sang Z, et al in which all subjects that supplemented with iodine experienced increased levels in TSH. The safest way to get Iodine is from vegetables

grown in iodine-rich soil, fish and shellfish (known to have low levels of mercury) and seaweeds (Christianson & Bender 226).

Dr. Aristo Vajdani, the chief scientific advisor for Cyrex labs believes that toxic mold may play a role in both intestinal permeability and thyroid disease. He believes that when there is mold in the environment it can increase inflammation and lead to the production of cytokines in both the brain and the digestive system. This can set the stage for antibody production and autoimmune disease. He also believes that all plasticizers, including those that are BPA free, are disruptive to the endocrine system and should be avoided by anyone with thyroid disease. Antibodies to BPA are reactive to thyroid tissue. Also, fire retardants, phthalates, dry cleaning material, heavy metals, cosmetics, pesticides and herbicides all contain chemicals that can be disruptive to the thyroid gland and endocrine system (Thyroid summit presentation).

Celiac Disease

There is evidence that a link exists between Celiac disease and autoimmune thyroid disease. Endocrine disorders such as Type 1 Diabetes as well as Hashimoto's have been associated with Celiac disease. Celiac disease is an autoimmune disease characterized by an intolerance to gluten proteins found in grains such as wheat, barley and rye. The symptoms of Celiac disease are typically gastrointestinal. In a study of 242 Celiac patients, hypothyroidism was present in 12.9% and only present in 4.2% of the control group (Freeman). Genetic polymorphisms have been found in both diseases that may link them together. It was found in another study that there was an association between Interleukin-15 and both Celiac disease and Hashimoto's. In both diseases, IL-15 was over expressed, leading to inflammation and tissue destruction (Stazi et al). Exposure to gluten in people with Celiac disease has been shown to lead to the overproduction of cytokines as well as the activation of B lymphocytes. IL-15 is thought to

play a significant role in the inflammatory state of the mucosa of the digestive system and the destruction of epithelial tissue within the intestine (Stazi et al.).

Viral

There is some evidence that points to a potential viral component in autoimmune disease and Hashimoto's. It has been theorized that viruses may be a factor in triggering or exacerbating Hashimoto's. However, no firm link has been made to any specific virus. Several viruses have been found to potentially have associations with Hashimoto's including HHV-6 (human herpes virus 6), the human cytomegalo virus, Hepatitis C and EBV (Epstein Barr Virus) (Caselli et al). Many doctors including Dr. Amy Myers, believe that infections can make their way into the body through intestinal permeability (Thyroid summit presentation). Dr. Brett Wisniewski believes that while food allergens play a role in autoimmune disease, there is usually some type of infection necessary to trigger the immune system.

In one study participants with Hashimoto's were found to have a higher prevalence of Hepatitis C antibodies than participants with any other thyroid disease. While the author of the study admitted that there was not enough information to conclude that Hepatitis C caused Hashimoto's, it was suggestive that a viral agent may be a factor in the autoimmune thyroid disease process (Duclos-Valee et al.).

In another study that explored the prevalence of the HHV-6 virus (human herpes virus 6) in Hashimoto's patients it was discovered that the Hashimoto's subjects had a substantially higher prevalence of HHV-6 than the control. 82% of Hashimoto's subjects versus 10% of the control group. While further studying the thyroid tissue of the Hashimoto's subjects it was found that the replication of the HHV-6 virus was taking place in the thyrocytes. The Hashimoto's

subjects had higher levels of CD4+ and CD8+ T cells that were specific to the protein presented as an antigen for HHV-6 (Caselli et al).

Another study provided a case history for three patients whose Hashimoto's presented within 6 months of the patients first HSV outbreak. Both HSV and anti-TPO antibodies were present in all three patients. While the authors of this study admitted that there was not nearly enough evidence in only three cases to make any statements regarding association, it was enough to prompt curiosity into further study (Crescenzo et al).

In Dr. Freeman's study on Celiac disease and hypothyroidism he points out that the observation has been made that viruses such as enteroviruses and rotavirus have been noted in patients with Celiac Disease. There is a strong link between Celiac Disease and Hashimoto's. It has been hypothesized that changes within the microbiome due to a virus may alter the immune system as well as digestive permeability (Freeman).

Low Vitamin D Status

It is not clear whether low vitamin D is a cause or an effect of Hashimoto's. Paul Bergner discussed a study showing as many as 95% of patients with Hashimoto's being vitamin D deficient. Low Vitamin D has been correlated with other autoimmune diseases as well.

Vitamin D has been found to have immunoregulatory and anti-inflammatory properties. Vitamin D acts on macrophages, dendritic cells and T and B lymphocytes, all of which have Vitamin D receptors. Vitamin D has also been shown to help regulate T cells. There is not a strong consensus on optimal serum levels of Vitamin D. Levels of 30 ng/ml or greater is considered sufficient at this time. It is possible that Vitamin D absorption is inhibited in individuals with autoimmune disease, especially if there is a digestive component such as dysbiosis, Celiac

Disease or food sensitivity. Low Vitamin D levels also correspond with geographic locations and this correlates as well with increased levels of autoimmune disease in these areas (Kivity et al).

Low Vitamin D levels have been correlated with Hashimoto's and one study found that 79% of participants with Hashimoto's tested low for Vitamin D (this study considered <10 ng/ml serum levels to be low) vs the control group with no autoimmune or thyroid disease with 30% testing at < 10ng/ml (Kivity et al.). In the same study the presence of thyroid antibodies was more common in participants with low Vitamin D levels. Low Vitamin D also appears to impact TSH levels. In the low Vitamin D group (<10ng/ml) the average TSH was 4.9 vs an average of 1.8 when Vitamin D was greater. Another study showed similar findings with 85.3% of Hashimoto's patients testing for low vitamin D levels (<30 ng/ml in this study). However, there was not a control group used in this particular study to compare to. Researchers did find that by increasing Vitamin D serum levels to >40 ng/ml resulted in a 20% decrease in anti-TPO antibodies (Mazokopakis et al.)

Variations within the VDR gene (this gene is responsible for encoding the cell receptor for Vitamin D) have also been considered a potential factor in endocrine autoimmune disease. Genetic studies have found an association between autoimmune thyroid disease and polymorphism of the VDR. There was also a study that demonstrated a link between polymorphism of the Vitamin D binding protein and Hashimoto's (Kivity et al.). This could suggest that people are genetically more susceptible to low Vitamin D levels.

Selenium Deficiency

Similar to Vitamin D, it is difficult to determine whether or not Selenium deficiency is actually causal in Hashimoto's or if it is a consequence of factors related to hypothyroidism.

Selenium is known to play two roles in regard to thyroid health. Selenium is necessary for converting T4 into T3. The enzyme deiodinase type 1 is partly made up of selenoproteins and is necessary in the removal of an iodine molecule in the process that produces both T3 and reverse T3. Selenium is also crucial in preventing free radical damage to thyroid tissue. There are known to be large stores of Selenium in the thyroid. Selenoproteins also are an element in glutathione peroxidase which impacts DNA repair and gene expression. Selenoproteins are also involved in the synthesis of thyroid hormones (Stazi et al.). Selenium deficiency can be related to inadequate dietary intake or to malabsorption disorders such as Celiac disease, Crohn's disease, pancreatic insufficiency, liver disease and other chronic illness (Stazi et al). Because increased cytokines are a factor in Hashimoto's, adequate Selenium and Glutathione Peroxidase are both crucial for modulating inflammation and repairing cellular damage from inflammation.

Food Allergens

There is a lot of evidence that food allergens contribute to inflammation and autoimmunity. More attention will be given to this topic in another section.

Stress

Many doctors believe that stress is a factor in Hashimoto's. Dr. Arem believes that you cannot adequately address thyroid disease without addressing stress and recommends his patients to do meditation, tai chi and yoga regularly. Dr. Mark Hyman believes that high stress affects the conversion of T4 into Reverse T3. He recommends to his patients to reduce stress and get a good amount of sleep. Dr. Hyman believes that Reverse T3 should be tested and that excess levels can negatively affect thyroid function because it can mean that too much T4 (the storage form of active thyroid hormone) is being excreted in too large of amounts. He recommends his patients

to get a minimum of 7-8 hours of sleep. Dr. Perlmutter also agrees that stress is an important component in thyroid disease. He points out that stress increases cortisol and that cortisol increases intestinal permeability (Thyroid summit presentation). Dr. Brett Wisniewski has noted that in his practice it is common to see autoimmune disease appear after very stressful or traumatic events in people's lives.

Estrogen and Thyroid

Autoimmune hypothyroidism is much more common in women than in men. It is thought that estrogen may play a role in this. Dr. Margaret Chistensen explains that when there are large amounts of estrogen hormones they take the place of thyroid hormone on SHBG (sex hormone binding globulin). SHBG is what transports hormones around the body for use in peripheral tissues. When there is too much estrogen, there is not enough room on the SHBG for thyroid hormone. When thyroid hormone production is low to begin with, excess levels of estrogen can exacerbate the problem. In addition to this, in hypothyroidism there can be low levels of SHBG. Stress can also be a factor in this. When under a lot of stress the hormone Progesterone is used to make cortisol, lowering the ratio of progesterone to estrogen and further perpetuating excess estrogen levels (Thyroid summit presentation). A symptom of Hashimoto's may be an increase in symptoms of PMS (premenstrual syndrome). Estrogen has a blocking effect on the cell membranes and can reduce the amount of T3 cells are able to take in. Because of this, symptoms of hypothyroidism may be exaggerated the week prior to menses (Christianson et al, 211).

The Food Allergy Autoimmune Connection and Intestinal Permeability

Several foods have been implicated in connection to autoimmune disease. These include wheat/gluten, dairy/casein, soy, nuts, eggs and nightshades. There have been strong associations made between gluten and Hashimoto's. Celiac Disease has been linked to Hashimoto's, which is an autoimmune disease distinctly characterized by antibody production in response to gluten. In addition to food allergies there has been a connection discovered between autoimmune disease and intestinal permeability, commonly referred to as "leaky gut".

Food allergies and autoimmunity

In a study on the increased prevalence of hypothyroidism in patients with Celiac disease it was noted that those that followed a strict gluten free diet all experienced a normalization of subclinical hypothyroidism (Freeman). In this same study the author, Dr. Hugh James Freeman stated "some autoimmune disorders may also require time to evolve, perhaps increased intestinal permeability may allow excessive amounts of antigen to enter the circulation and cross-react with other tissues, including the thyroid gland." In this statement, there is the hint that food allergies may be a factor in Hashimoto's. Removal of gluten has been shown to reduce TPO antibodies (Stanzi et al.) Dr. Freeman also noted that patients may not respond to thyroid replacement therapy because of reduced surface absorptive area in the small intestine due to damage (Freeman). An inflammatory cytokine, IL-15 has been shown to be over expressed in both Hashimoto's and in Celiac disease. IL-15 plays a role in inflammation within the intestine as well as damage within the epithelium in the intestine (Stanzi et al.) There is also the potential

that Celiac disease can lead to malabsorption of essential nutrients, such as Selenium and Vitamin D, which have also been found to play a role in autoimmune thyroid disease. Interestingly there are large amounts of Selenium in wheat and cereal grains that are often eliminated when people with Celiac disease adopt a gluten free diet. However, if malabsorption due to intestinal damage is a factor than the Selenium may not be properly absorbed.

North American herbalist Paul Bergner has studied food allergies for decades and has found that food allergens within autoimmune conditions appear to be very common. In a seminar Paul Bergner gave on autoimmunity, inflammation and food allergies he went into great detail in explaining the connection between the digestive system and the immune system.

According to Paul, an autoimmune reaction can be initiated by a reaction within the digestive system to a particular peptide sequence found in food. Common foods for people to be allergic to are: gluten in wheat, dairy, soy, eggs, nuts and nightshades. Each food has proteins that are broken down in the stomach into peptides. It is specific peptides and peptide sequences that then become recognized as an antigen. When a food that a person is allergic to is ingested, it comes into contact with lymphoid tissue located throughout the digestive system. Certain peptides found in food are recognized by the immune system as an antigen and either bind to a B-cell or are eaten by a macrophage and the macrophage presents the antigen to a T-cell. The T cell begins producing cytokines which then trigger B cells to make antibodies. These peptides or peptide sequences can appear similar to human tissue, such as thyroid tissue. There is a known amino acid sequence in gliadin (a protein in gluten) that is identical to a peptide sequence in collagen. There are many different peptide sequences possible with gluten. Gluten peptides have bio-identical sequences to the protein calreticulin in the intestinal wall. Because this reaction is happening on a molecular level, even microscopic amounts can cause an immune response.

Antibodies can become systemic and can attach to sites of previous inflammation throughout the body. B Plasma cells can migrate throughout the body producing antibodies. Plasma cells are able to travel to sites of previous or current inflammation. When a plasma cell reaches a site of inflammation it becomes like an accelerant on a fire. The plasma cell is able to create lots of antibodies. When a person eats a food that they are allergic to, the cascade of immune system events that is kicked off can activate inflammation and autoimmune reactions all over the body (Bergner). Paul Bergner said that “activation of the lymphocytes in the gut lining may cause systemic inflammation, allergy, or autoimmunity through immune cytokine secretion, antibody production, or migratory immune cells throughout the immune system.” Once these antibodies have been made, more than likely this will become a lifelong allergy. It is possible to heal the intestine using a gut healing protocol, but it is still necessary to stop eating the food allergen. According to Paul, 80% of lymphatic tissue is located in the abdominal cavity and there are more lymph nodes in the stomach and spleen than anywhere else in the body altogether. This makes sense considering that a large amount of outside material goes through the digestive system every day and is a very common source of pathogens (Bergner and CSCH class notes). When inflammation is initiated by a food allergen or anything else, the liver secretes C-Reactive Protein. This turns up the inflammatory response throughout the body. It was once thought that CRP was a symptom of inflammation, but it is also capable of accelerating inflammation. Chronic inflammation in the digestive system due to ingestion of food allergies could lead to increased levels of CRP and aggravate inflammation throughout the body (Bergner). Exposure to food antigens can result in elevated levels of CRP.

Dr. Tom O'Bryan thinks that gluten is a toxin and that after prolonged and frequent exposure to gluten the intestines ability to heal is compromised. His explanation for how the

body makes antibodies in response to peptides in foods is very similar to Paul Bergner's. Dr. O'Bryan feels that environmental factors have led to an exaggerated response to food allergens. While he feels that wheat has always been mildly toxic, he thinks that several environmental factors such as: GMO foods, heavy metals, chemicals, vaccines, stress and EMF's are stressing the immune system and making the body more sensitive to food allergens. Dr. O'Bryan recommends that everyone with Autoimmune Thyroid disease not eat gluten or dairy. (Thyroid summit presentation).

Intestinal permeability or “leaky gut”

“Leaky” barrier function or intestinal permeability is another factor in the food allergy, autoimmune and inflammation triangle. When there is permeability within organs this increases the likelihood of autoimmunity. Peptides and proteins that could be recognized by the immune system as antigens have the opportunity to get into the blood stream when they normally wouldn't. Permeability within the fibrous capsule that covers the thyroid gland has been recognized as a potential factor in thyroid autoimmunity. Intestinal permeability is not a factor in all food allergies. It is possible for peptides to be recognized as antigens without intestinal permeability due to the presence of exposed lymphatic tissue throughout the digestive system, such as Peyer's Patches. However, intestinal permeability may increase the likelihood of autoimmunity. Factors that cause intestinal permeability are becoming more common in modern life. Vitamin D deficiency, trace mineral deficiency due to soil depletion (particularly silicon and copper), antibiotic use, high sugar consumption and a high Omega 6 to Omega 3 essential fatty acid ratio in the diet all contribute to potential intestinal permeability. Inflammation on its own could lead to intestinal permeability. Inflammation due to food allergens could be the cause of intestinal permeability and not the other way around (Bergner and CSCH class notes).

Dr. Alessio Fasano is a leading researcher on intestinal permeability. He discusses a molecule called Zonulin. This is a protein in the digestive system capable of deciding when the "bridges" come down in barrier tissue. Zonulin is able to let friendly molecules in and can selectively determine the degree of barrier function necessary. He describes dysfunction within Zonulin as "the bridges go down but don't come back up". Meaning this molecule is no longer regulating barrier function, determining what types of molecules are allowed between the junctions in the intestine. This means that antigens have the potential to slip through the walls of the intestine unregulated. His theory is that Zonulin becomes dis regulated due to inflammation. His theory is that the immune system is not equipped for modern life and many factors exist in today's world that the immune system is not trained to recognize. Constant exposure to pesticides, pharmaceutical drugs, chemicals, alcohol, additives in food the body does not recognize as food, antibiotics, etc. activate the immune system. He describes the immune system as being set up to go back into a "non-attacking" mode once the "enemy" is gone. However, in today's society it may be perceived that the enemy is never gone due to constant exposure to perceived threats (Thyroid summit presentation).

Dr. David Perlmutter, the author of "Grain Brain" feels that another factor in intestinal permeability is the use of glyphosate, the main ingredient of "Round up", an Herbicide that is commonly used on wheat and other foods. This is known to damage detox pathways and is a microbiome disrupter. Not only is glyphosate extremely toxic, it binds to minerals. Because of the important role that minerals play in thyroid health, this makes it even more damaging to people with Hashimoto's (thyroid summit presentation).

Both the integrity of the intestinal lining as well as the bacteria found within the intestine play important roles in keeping the immune system healthy. Acidophilus and bifidobacterium are

important species of microflora within the intestines that make up a protective layer. The health of the microbiome within the intestine is necessary for healthy barrier function. Dysbiosis of the intestinal microflora can lead to inflammation and erosion of the intestinal barrier (Bergner). Another factor in proper barrier function as well as inflammation throughout the body is proper Prostaglandin balance. Prostaglandin balance is important in modulating inflammation both within the digestive system as well as outside of it. Prostaglandins are hormones responsible for promoting healing within the body and modulating inflammatory response. While a certain level of inflammation is necessary for proper healing, having an imbalance of too many pro-inflammatory prostaglandins can lead to damaging inflammation and potentially autoimmune disease. Prostaglandin imbalance can come from a diet with a high Omega 6 to Omega 3 essential fatty acid ratio. Prostaglandins play a role in gut lining repair and in the constant turnover of epithelial cells within the intestinal lining. They are critical in making sure that intestinal integrity is maintained. NSAID's can shut down the production of prostaglandins necessary for healthy intestinal repairs. Due to this, NSAID use alone can lead to intestinal permeability (Bergner and CSCH class notes).

Nutritional Protocol for Hashimoto's

Healing Intestinal Permeability and Removing Allergens

Healing intestinal permeability and removing food allergens is key to supporting the body to heal in cases of Hashimoto's. By resolving intestinal permeability inflammation is reduced and proteins are no longer able to leak into the blood stream. By removing food allergens the body will stop producing antibodies to the peptides in specific foods and inflammation will be reduced.

The primary objective of an intestinal healing diet aside from elimination of the food allergen should be to replenish nutrients. Because nutrient deficiency is a common factor in both intestinal permeability as well as Hashimoto's, it is very important that a nutritional protocol for a Hashimoto's client include a nutrient dense, whole foods diet. Getting a person to be nutritionally replete is the first step in any autoimmune protocol and should take place prior to food allergy elimination. Removing chemically altered and rancid oils, reducing sugar, increasing protein, eating 10 cups of fruits and vegetables (preferably cooked vegetables) and increasing fiber are all aspects of an intestinal healing protocol.

Eating a large breakfast that is rich in protein, with a total of 500-600 calories is the first step in creating a nutrient dense diet. This will help to balance blood sugar and insulin levels. This alone can help improve energy throughout the day (Christianson et al. 260). Enterocytes within the digestive system require large amounts of protein due to constant turnover. Protein and fiber are necessary for proper function and digestive cell turnover. Dr. Arem recommends

his patients to eat 30 grams of fiber every 24 hours (Thyroid summit presentation). Eating soups and stews with meat is highly recommended, especially broths with collagen. Boiling meat allows for nutrients both from the meat and the broth. If possible it is important that a nutrient dense diet include animal protein. Meat contains glutamine, an animal protein that is restorative to intestinal tissue. Enterocytes can use glutamine as fuel as well as for structural purposes (Bergner). It is common to read that certain vegetables called “goitrogens”, including: brassicas, sprouts, kale and cabbage are bad for the thyroid because of a constituent called indole-3-carbinol. Indole-3-carbinol can inhibit the thyroid’s ability to absorb iodine. However, Dr. Christianson believes that a normal amount of these (100 grams/day) should be fine and that they should not be avoided due to substantial health benefit gained from eating them (Christianson et al. 256). Indole-3-carbinol has been shown to support detoxification pathways and potentially reduce cancer risk (Meschino).

Another factor in intestinal healing is supporting the microbiome. Using Burdock (*Arctium lappa*) root and Astragalus root in stews helps to feed beneficial bacteria within the microbiome. Prebiotics promote “good” bacteria within the digestive system. The bacteria within the digestive system metabolize fibers in pectin, inulin and cellulose in order to make short chain fatty acids which are used as fuel by the enterocytes and are also important in immune signal processes both locally and systemically. SCFA’s help to initiate gut lining regeneration (Bergner). Dr. O’Byrne has a similar gut healing protocol to Paul Bergner. He puts a very strong emphasis on eating fermented foods. He recommends his patients go to the grocery store and buy 5-6 different types of fermented foods and take 1 fork full a day of different kinds to get a wide range of diverse bacteria (Thyroid summit presentation).

Removal of “bad fats” and oils is another key step in a nutritional protocol for Hashimoto’s. Pro-oxidative and refined oils that are used in processed foods should be completely removed from the diet. These oils are pro-inflammatory. Oils that are not “normal” such as safflower, corn and peanut oil and oils that have not been used throughout human history because chemical processes are necessary for extraction should be avoided. These oils are heated at extremely high temperatures and often times chemicals are necessary in the extraction process. Oils that have been exposed to high temperatures are typically rancid, but because of chemical deodorization processes the smell is unnoticeable. Anything that says “hydrogenated” or “partially hydrogenated” should be avoided. These oils contribute to prostaglandin imbalances and are often extremely high in Omega 6 fatty acid.

Food allergy removal must be complete and permanent. B plasma cell production peaks at 4-5 days, so even eating a microscopic amount of a food allergen one time a week can keep inflammation and antibody production high (Bergner). Gluten is a key allergen in Hashimoto’s with clear evidence of a correlation between Celiac disease and Hashimoto’s. Most experts agree that removal of gluten is a first step in a Hashimoto’s nutritional protocol. However, there may be other food allergens involved and in Celiac patients casein has been found to cause antibody production as well. Dr. Wisniewski recommends all his Hashimoto’s patients remove gluten, dairy and soy as a starting point for food allergen elimination.

Removal of toxins

Cutting back on foods that contain toxins will support thyroid health and should be a part of a nutritional protocol for someone with Hashimoto’s. Artificial chemicals and toxins are potentially damaging to the thyroid. Eating natural and unprocessed foods is a natural part of a

nutrient dense diet. There are over 100,000 chemicals registered for commercial use within the United States. Avoiding processed foods is the best way to avoid these chemicals.

Removal of Mercury from the diet is very important as well. Corn syrup is often made using mercury based components and is found in thousands of different processed foods. Even in small amounts, Mercury can be stored in the thyroid and can become a problem over a long period.

Eating organic produce and meat is helpful in avoiding pesticides and artificial chemicals. Pesticides can be very damaging to the intestines and can aggravate inflammation similarly to food allergens. Buying seasonal produce is often a cheaper way of purchasing organic. Many modern farms feed cows corn and give them bovine growth hormone and antibiotics. Buying organic, pasture raised, grass fed meats is the best way to avoid these toxins (Christianson et al. 223-224).

Perchlorate is a chemical byproduct of rocket fuel production. Because of its similarity to iodine, this chemical can disrupt thyroid function. It has been found in the water supply of over 35 states. Drinking bottled water would be a method for avoiding this toxin. Similarly, Fluoride is a chemical that is added to the water supply in most parts of the US. The more fluoride the thyroid absorbs the lesser amount of iodine it can absorb. Fluoride is well known to reduce the production of thyroid hormones and is used as a treatment for hyperthyroidism. Drinking bottled or reverse osmosis water is a way to avoid fluoride exposure. Because fluoride may still be present in some types of bottled water, research may be necessary to find the best bottled water in a specific region. Reverse osmosis and distilled water are known for being fluoride free (Christianson et al. 260-262).

PFOA or perfluorooctanoic acid is also a contributor to thyroid disease. This chemical is used in Teflon cookware and microwave popcorn bags. Avoiding using these materials when cooking food may be helpful in Hashimoto's (Christianson et al. 262).

Necessary Nutrients and Supplementation

Supplementation is often necessary for several reasons. Because nutritional deficiency is a common factor in Hashimoto's it may be required in order to help someone to become nutritionally replete. It is possible that there are genetic polymorphisms in Hashimoto's (for example, the Vitamin D receptor polymorphism) that require someone with Hashimoto's to get more of a specific nutrient than would normally be found in their diet. There are also regional factors, such as with Vitamin D, people not living along the equator must supplement with Vitamin D in the winter because they do not make adequate amounts naturally. Also, certain nutrients are not always as available through food as they once were due to soil depletion.

Iodine

The most popular supplement formulas on the market for thyroid disease usually contain Iodine. Iodine is fairly easy to get from the diet and too much iodine can be harmful to the thyroid. While the DRI is 150-300mcg of iodine, many products contain doses of 1,000-50,000 mcg (Christianson et al. 46). There are many internet sources that suggest taking supplemental iodine for thyroid disease, but in this amount it may actually do more harm than good. Unless there is a known dietary deficiency, iodine supplementation is not necessary. 50-100 mcg/day should be enough iodine to restore normal iodine status (Christianson et al. 8).

Tyrosine

Because thyroid hormone is made up of both tyrosine and iodine, it is important to get enough of both. Tyrosine is not commonly supplemented. On a nutrient dense diet a person should get enough Tyrosine. Tyrosine is found in high-protein foods such as: milk, soy, pumpkin seeds, sesame seeds and almonds (Christianson et al.)

Selenium

Selenium supplementation is controversial. Supplementation is often recommended because the Selenium content available in foods is highly dependent on soil concentrations where the food is grown (Stanzi et al). Not all studies have found benefits from Selenium however. In a study that compiled and analyzed the results of 4 other studies, the conclusion was that evidence supporting the use of Selenium in Hashimoto's thyroid disease is incomplete (Zuuren et al).

The enzyme responsible for converting T4 into T3 is deiodinase type 1. This enzyme is made partly from selenium. Without Selenium, the body has a difficult time converting T4 to T3, the active form of thyroid hormone. Without T3 the cells are not able to use the thyroid hormone for energy. Selenium is essential for proper thyroid hormone function. If T4 levels are high but T3 levels are low it could suggest a lack of Selenium (Christianson & Bender 11, 91).

Selenium is also necessary for optimizing the activity of glutathione peroxidase, an important factor in DNA and tissue repair. Endocrine tissues, including the thyroid gland have the highest concentration of Selenium storage (Stazi & Trinti, 3). Selenium may be necessary for protection of thyroid tissue, especially if inflammation and free radicals are present.

There has been an association made between Celiac Disease, Hashimoto's and Selenium deficiency. It is not well understood whether Selenium deficiency may be a causative factor in

either disease, or is the consequence of malabsorption due to Celiac Disease and intestinal damage. There is also evidence that Selenium may play a role in modulating inflammatory cytokines and reducing oxidative damage in tissues in both the digestive system as well as the thyroid and other organs (Stazi & Ritzi, 4-5).

The USA RDA for Selenium is currently at 55 micrograms for adults. Selenium excess is rare and usually requires long term intake of 400 micrograms/day or more. Selenium occurs in both organic and inorganic forms and both forms can be metabolized to selenocysteine. The inorganic forms are what dietary supplements of Selenium are composed of. One Brazil nut contains about 80 mcg, more than the RDA (Dr. Christianson et al). Dr. Ridha Arem recommends that his patients with Hashimoto's get 150 mcg/day (Thyroid summit presentation).

Vitamin D

While it's not well understood whether Vitamin D deficiency causes autoimmune disease or if it is a result of autoimmune disease, vitamin D deficiency has been documented in multiple autoimmune diseases and specifically in Hashimoto's. In a study on Vitamin D levels and Hashimoto's patients specifically, participants with Hashimoto's vitamin D levels were compared to participant's with non-autoimmune hypothyroidism as well as a control group with no history of either autoimmune or thyroid disease. In the Hashimoto's group 79% of the group tested for low Vitamin D levels (<10ng/ml) in comparison with the control group where only 30% tested low on Vitamin D as well as the non-autoimmune thyroid disease group with 63% having low levels of Vitamin D (Kivity et al). It is possible that there are genetic factors in people with Hashimoto's either absorbing or utilizing Vitamin D appropriately. Vitamin D binds to VDR receptors and can activate VDR responsive genes. VDR polymorphism has been associated with autoimmune disease (Kivity et al.).

Vitamin D is essential for appropriate barrier function within the intestines. The proteins within the cellular junctions inside the intestinal wall are dependent on vitamin D for proper function (Bergner). Vitamin D is likely a factor in the link between intestinal permeability and autoimmune disease. Vitamin D is also a known immune modulator and is essential to proper function of the immune system.

Vitamin D has been shown to lower thyroid antibody levels. In another study performed on patients with Hashimoto's living on the Greek island of Crete, a similar portion of Hashimoto's patients tested positive for low Vitamin D levels, 85.3% were considered to have low Vitamin D levels (there was no control group used in this study for comparison). However, in this study anti-TPO and anti-TG antibodies were measured after 4 months of Vitamin D supplementation. It was found that there was a statistically significant drop in antibody levels after 4 months. Participant's supplemented with 1200-4000IU of vitamin D3 (cholecalciferol, CF) orally for 4 months. The difference in dosages was determined based on the assumption that for every 100IU of Vitamin D3 ingested the blood level of 25(OH)D would raise by 1 ng/ml. Dosage was determined based on the participant's vitamin D serum levels at the beginning of the study. The goal was to get the participant's 25(OH)D level to 40 ng/ml or above. All participants in the study tested positive for anti-TPO antibodies. There was a negative correlation found between serum vitamin D levels and anti-TPO antibodies. After 4 weeks of individualized doses of D3 supplementation there was a 20.3% drop in anti-TPO antibodies (Mazokopakis et al.)

The standards for vitamin D3 supplementation and dosing are not very clear. However, the US Endocrine Society sets the guideline that adults with vitamin D deficiency should use 50,000 IU vitamin D3 once a week, or 6,000 IU's daily for 8 weeks in order to raise blood levels

above 30 ng/ml and then use a maintenance dose of 1500-2000IU daily. However, the US Endocrine Society does not have specific guidelines for Hashimoto's patients.

Paul Bergner's Vitamin D protocol: Supplement with D3 or make sure to get sunlight (20 minutes for light skin and up to 3 hours for dark skin) at true noon. The dosage Paul uses is 4000 IU's in summer and up to 7000 IU's per day in winter. May do 50,000 IU's once a week. According to Paul the goal is to get to >50 ng/ml serum levels (Bergner).

Fish oil

EFA's in Fish oil are essential for controlling inflammation associated with Hashimoto's. Per Paul Bergner the level of inflammation seen in cases of autoimmune disorder is too high for flax seed or other forms of EFA's to be effective. He recommends 1 gram of combined EPA/DHA per day (Bergner). Sardines can be eaten in place of taking supplemental Fish oil.

Probiotics

Probiotics may be necessary in restoring balance to the microflora in the digestive system. This is common in autoimmune disease and often dysbiosis is a factor in intestinal inflammation. Paul Bergner outlined the following Probiotic protocol for a person with autoimmune disease:

150 organisms/day (mixed species of acidophilus, bifidobacter and more) for 4-7 days. Aim for as many different species as possible. Follow with 10 billion organisms per main meal for 10 days. Maintain with 10 billion organisms with intermittent breaks. With each dose of probiotics take 1-2 tsp of Arctium powder in water. It is important to make sure that good probiotics such as burdock, astragalus, dandelion, etc. are being consumed during the duration of

the Probiotic protocol also. Cultured foods are a great way to maintain good gut flora after the protocol.

B-Vitamins and Methylated folate

Dr. Ben Lynch has extensively studied the MTHFR genetic mutation. He believes that getting enough methylated folate is essential for supporting glutathione production. The thyroid needs glutathione for proper cellular and DNA repair (Thyroid summit presentation). Methylated folate is available independently in supplement form. However, a more balanced way to get methylated folate would be through a B-complex vitamin supplement. The form of folate should be “active” or “methylated”. Methylated folate is also found in leafy greens. Dr. Ben Lynch believes that methylated folate is best when it is in its natural form in leafy greens and vegetables (Thyroid summit presentation).

Additional Supplements

Calcium d-glucarate- Because estrogen excess can exacerbate hypothyroidism, taking Calcium d-glucarate may be helpful. Supplements of this contain a synthetic version of glucuronic acid. This is a protein your body makes to bind to estrogen. This can be taken during the third week of the menstrual cycle to insure proper excretion of estrogen. 500 mg/day is the recommended dose. This taken with an increase of fiber will assist the bacteria in the colon to properly break down the hormones and excrete them. 1-2 tablespoons of flaxseed a day will provide the necessary amount of fiber (Christianson et al. 212).

Vitamin E- Dr. Ridha Arem recommends that his patients supplement with vitamin E in addition to Selenium for proper glutathione production. He recommends 200 units of vitamin E daily (thyroid summit presentation).

Herbal Therapeutics and Protocols

There are a few different strategies employed by herbalists in developing an herbal therapeutic protocol for Hashimoto's. Primarily these strategies include using nutritive herbs, adaptogens, immunomodulating herbs, anti-virals and gut healing herbs. There are also particular herbs and formulas that have been clinically proven to normalize thyroid hormone levels and reduce antibodies.

Gut Healing protocol

Due to intestinal permeability and inflammation within the intestines, an herbal gut healing protocol should be used in almost all Hashimoto's clients.

The components of a gut healing protocol include: anti-inflammatory herbs, nutritive herbs, vulnerary herbs and immunomodulating herbs.

Herbs to use in a gut healing formula:

Calendula (*Calendula officinalis*)- Calendula is a vulnerary and an alterative. It is used for healing abrasions and injuries to the skin. It is through this action that Calendula is helpful in repairing the gut lining. Dose is 3-9 grams in an infusion (Tierra 109).

Chickweed (*Stellaria media*)- This herb is vulnerary and nutritive and anti-inflammatory. Similar to Calendula it is helpful for healing the gut and lowering inflammation. The dosage is a standard infusion of one ounce herb to a quart of water. Taken three times daily or as needed (Tierra 119).

Plantain (*Plantago*)- Plantain is a vulnerary, anti-inflammatory and alterative. It is good for all internal inflammations. Its' vulnerary properties are useful for treating wounds both internal and external. The dose is a standard infusion (a standard infusion is defined as 1 ounce herb infused in a quart of water) (Tierra 179).

Marshmallow root (*Althaea*)- Marshmallow is anti-inflammatory and moistening to the digestive system. It is soothing and cooling to inflamed tissues. The standard dose is 6-16 grams in a cold infusion or decoction (Holmes, 469).

Licorice root (*Glycyrrhiza glabra*)-Licorice is demulcent, alterative and anti-bacterial. It has a soothing and cooling affect on inflamed tissues. According to Paul Bergner, Licorice may have a potent anti-inflammatory effect on the upper GI. The dose is 3-10 grams in an infusion or decoction (Tierra 110).

Chamomile (*Matricaria recutita*)- Chamomile is a strong anti-inflammatory. Chamomile is used for many different types of intestinal disorders and is also stimulating to the liver (Tierra, 110). The standard dose is either standard infusion (28 grams to a quart of water) or 10-30 drops of tincture.

Peppermint- (*Mentha x piperita*)- Peppermint is carminative and anti-microbial, antibacterial and antiviral. It has been shown to inhibit the biosynthesis of leukotrienes and prostaglandins (Skenderi 292). The standard dose is: 3-7 grams in infusion (Holmes 152).

Fennel seed- (*Foeniculum vulgare*)- Fennel is a gastrointestinal tonic, carminative and antibacterial (Skenderi 151). Fennel warms the digestive system and promotes digestion. The standard dose is: 6-12 grams in infusion or decoction.

Nutritive herbs

Nutritive herbs are an important aspect to a gut healing herbal protocol. Herbs rich in minerals provide important nutrients for repairing and rebuilding structure within the intestine, as well as providing essential nutrient cofactors to many different metabolic processes that impact thyroid function as well as general health. Below is a chart of the mineral content of common herbs:

Table 2: The Mineral Content of Selected Herbs (per ounce)

	Calcium	Chromium	Iron	Magnesium	Potassium	Selenium
	(Mg)	(mcg)	(mg)	(mg)	(mg)	(mcg)
Alfalfa	299	30	0.87	76	400	0
Burdock	244	10	4.9	179	560	50
Catnip	205	90	4.6	69	783	410
Chickweed	403	40	8.4	176	280	140
Comfrey leaf	600	60	0.4	23	566	40
Horsetail	630	10	4.1	145	520	40

Kelp	1013	20	0.5	289	703	60
Licorice	292	60	2.9	321	380	0
Marshmallow	272	50	3.8	172	403	110
Nettle Leaf	966	130	1.4	286	583	70
Oatstraw	476	130	0.4	400	90	40
Peppermint	540	0	2.0	220	753	40
Red Clover	436	110	0.0	116	666	30
Red Raspberry	403	40	3.3	106	446	80
Skullcap	151	20	0.8	37	726	30

(Pedersen 1994)

Paul Bergner's Gut Healing Herbal Protocol

Paul Bergner uses two specific formulas in his gut healing protocol. A nutritive formula rich in silicon and copper for healthy barriers and intestinal integrity and a gut healing formula for repairing digestive tissue.

Basic nutritive formula (Paul Bergner):

Nettles (*Urtica dioica*)-Alterative, anti-inflammatory and nutritive

Horsetail (*Equisetum*)- Rich in silicon, connective tissue restorative.

Comfrey (*Symphytum*)- Nutritive, vulnerary, connective tissue restorative.

Dosage: Prepare a standard infusion and drink 16 oz-32oz/day

Basic gut healing formula (Paul Bergner)-

Paul Bergner's "go to trinity" for gut healing are:

Marshmallow (*Althaea*)- Moistening, cooling, anti-inflammatory

Calendula- Vulnerary, anti-inflammatory, lymphatic stimulant.

Plantain (*Plantago*)- Anti-inflammatory, tonic, anti-bacterial

Paul Bergner's standard gut healing formula:

Peppermint (*Mentha x piperita*), Chamomile (*Matricaria recutita*), Fennel (*Foeniculum*),

Licorice (*Glycyrrhiza*) and Plantain (*Plantago*) in equal amounts in a standard infusion.

Paul also highly recommends powdering herbs for gut healing and has found this to be the most potent method for delivering gut healing herbs. According to Paul, powders and infusions are most effective. Tinctures are not effective in a gut healing protocol.

Anti-virals

Due to the potential viral component of Hashimoto's, some practitioners have had success using anti-viral herbs in Hashimoto's patients. Dr. Wisniewski has seen anti-viral herbs work in a variety of autoimmune disorders.

Anti-viral herbs to consider using in formula:

Cat's Claw (*Uncaria tomentosa*)- This herb is both anti-inflammatory and antiviral. It can be used for detoxifying the GI system and is anti-microbial and anti-viral. 1 tbsp of the bark simmered in 1 cup of water. Take 1 cup 3 times a day (Tierra 115).

Lemon Balm (*Melissa*)- Melissa is an anti-viral that has specifically been used for the Herpes virus. The standard dose is one ounce to a pint in an infusion (Tierra 151).

Licorice root (*Glycyrrhiza glabra*)-Licorice is anti-bacterial and antiviral. Licorice has been used specifically for Herpes Virus as well. The standard dose is: 3-10 grams in infusion or decoction (Tierra, 231).

Dr. Brett Wisniewski's anti-viral protocol for autoimmune disorders includes: lyseine, astragalus, olive leaf, reishi.

Astragalus (*Astragalus mongolicus*)- Astragalus is a stimulant, a diuretic and a tonic. It is used to build resistance to disease. The dosage is 6-15 grams.

Olive leaf- (*Olive europa*)- The leaves can be used internally and are commonly used for treating inflammation and viruses and reducing fevers. The dosage is 1 tablespoon leaves in 1 cup of boiling water- take 2 cups daily.

Reishi- (*Ganoderma*)- Reishi is a known immunomodulator and has been proven to help promote balance between the T1 and T2 cells in the immune system. It is difficult to find dosage details on Reishi. From the CSCH class notes from Matthew Becker, he recommends a strong decoction of the mushroom.

Adaptogens

Adaptogens used in an hypothyroid herbal protocol are primarily therapeutic for the fatigue related symptoms. It would be especially helpful to use adaptogens to increase energy level in people working to make lifestyle and dietary changes. Some practitioners focus primarily

on adaptogens in cases of hypothyroidism for symptomatic relief of fatigue and reduced stamina. However, stimulating adaptogens should not be used long term due to the potential to further deplete energy.

Adaptogens to consider using in formula:

Siberian Ginseng (*Eleutherococcus senticosus*)- This herb is an adaptogenic energy tonic. It improves stamina and energy levels. In a study on Russian workers performed by Dr. I.I. Brekhman it was shown to improve stamina and workers recovered more quickly from exertion (Tierra 193). This could be used in formula to temporarily improve energy levels and stamina in hypothyroidism while a person makes lifestyle and dietary changes.

Suma (*Pfaffia paniculata*)- This is a root that is used similarly to ginseng in Brazil. It is an energy tonic, adaptogen and nutritive. Most of the clinical data on this herb is in its use as an effective therapeutic for breast cancer. However, Michael Tierra notes that he has used it effectively on patients for Epstein-Barr virus and has seen it to be very effective for chronic fatigue like symptoms and for improving overall feelings of wellbeing. He states that he would "not hesitate to recommend it to anyone with chronic fatigue or low energy" (Tierra 199). The dosage is 3-6 grams 2-3 times/day. Michael Tierra recommends starting with 3 grams in warm water every two waking hours or at least 4 times/day and then gradually increasing the dose to 6 grams four times a day. He recommends using the herb with a diet of all cooked food, whole grains, beans and a little bit of cooked meat or dairy (Tierra 198).

Ginseng (*Panax ginseng*)- Ginseng is a powerful tonic that is very useful for giving a person more energy and stamina. This is helpful for clients trying to overcome a prolonged period of stress or weakness. Used for a short period this can be a great way to give someone the energy to make lifestyle and dietary changes and enhance their feeling of wellbeing (Tierra 229).

Dr. Aviva Romm's herbal protocol

Dr. Aviva Romm primarily focuses her herbal protocol for Hashimoto's on reducing fatigue and improving metabolic function. Her formula primarily focuses on the use of adaptogens.

Aviva Romm's tincture for Hypothyroidism:

Coleus (*Coleus forskohlii*) 20 ml

Ashwagandha (*Withania somnifera*) 20 ml

Bladderwrack (*Fucus vesiculosus*) 15 ml

Licorice (*Glycyrrhiza glabra*) 10 ml

Guggul (*Commiphora mukul*) 10 ml

Nettles (*Urtica dioica*) 10 ml

Reishi Mushroom (*Ganoderma lucidum*)- 10 ml

Ginger (*Zingiber officinalis*)- 5 ml

Dose: 5ml morning and noon

Bladderwrack is considered a controversial therapeutic for hypothyroidism among herbalists due to its high iodine content. Bladderwrack may be inappropriate for Hashimoto's.

Coleus- an Ayurvedic herb that has been used for centuries to stimulate thyroid function (Romm 191).

Guggul- Guggul is thought to act on the conversion between T3 and T4, increasing T3 with no change in T4 hormone levels (Romm, 191).

Individual herbs clinically proven to improve thyroid function

Cordyceps

Cordyceps has been used therapeutically in Traditional Chinese Medicine to increase oxygen utilization in ATP production (He, Zhao, Lu, et al. 2). Cordyceps has been seen to be effective in other autoimmune-inflammatory diseases such as asthma, type 1 diabetes, and chronic nephritic disease (He, Zhao, Lu, et al 5). There is evidence that using *Cordyceps sinensis* in an herbal protocol for Hashimoto's would be well indicated for anyone with this disease. In a study performed using what was termed a "Cobrin Capsule" (2 gram capsule of fermented *Cordyceps sinensis*), participants with Hashimoto's were given this capsule two times a day over 24 weeks. These participants showed a reduction in TPO antibodies by 51.3% and a reduction of TG antibodies of 39.49% in comparison to the control group (He, Zhao, Lu, et al. 4). This study was based on previous Chinese studies showing a similar reduction in TPO and TG antibodies using Cordyceps. The participants in the study with Hashimoto's were observed to have lower helper T cells in ratio to cytotoxic T cells. After 24 weeks of using the Cobrin Capsule, participants showed a lowered level of cytotoxic T cells in relation to helper T cells, showing evidence that the Cobrin Capsule was helpful in restoring T cell balance. In other studies,

Cordyceps has been shown to stimulate T lymphocytes, B lymphocytes, natural killer cells and macrophages. It also appears based on this study that it may be able to restore balance to helper T cells and cytotoxic T cells (He, Zhao, Lu, et al. 1, 6).

Nigella sativa

Nigella sativa- *Nigella sativa* has been used worldwide for chronic disease. There is evidence that this herb may be an effective therapeutic for Hashimoto's. *Nigella sativa* was found to reduce serum concentrations of TSH and anti-TPO antibodies while raising serum T3 levels. The study was performed on participants with Hashimoto's. Participants were given 2 grams of powdered *Nigella sativa* in capsule form for 8 weeks. One gram capsules were taken twice a day before meals. Concentrations of VEGF were also significantly reduced. The part of the plant that is used are the seeds. While there were no side effects noted in the study, 3 people from the treatment group did drop out due to nausea and itchiness. Four people dropped out of the control group for unknown reasons. It was also observed that BMI was reduced in the treatment group.

Nigella sativa has been used traditionally in folk medicine of the middle east for chronic disease, infections, obesity and gastrointestinal illness. The constituent thought to be responsible for most of this herbs' antioxidant and anti-inflammatory actions is thymoquinone.

Thymoquinone has anti-inflammatory effects and works by suppressing cyclooxygenase-2 (COX-2) expression. It is also thought that the anti-oxidant actions of this constituent could have

a protective effect on thyroid tissue. Because of this, the participant's consumption of vitamins C and E were monitored throughout the study (Farhangi et al.).

VEGF (vascular endothelial growth factor) is a type of cytokine and is present in several metabolic disorders. White adipose tissue cells produce VEGF, which may be used to increase vasculature. VEGF was reduced in the treatment group and it was thought that this may be the reason that participants in the treatment group saw a reduction in BMI and waist to hip ratio (Farhangi et al.).

Below is the table showing changes in TSH, T3, T4, Anti-TPO antibodies and VEGF taken from the study:

Metabolic parameters in treatment groups before and after intervention:

<i>N</i>	Nigella sativa	Placebo	<i>P</i> †
	<i>N</i> = 20	<i>N</i> = 20	
TSH (mIU/l)			
Before	6.42 ± 3.86	8.14 ± 7.28	0.35
After	4.13 ± 2.35	8.27 ± 7.21	0.02
<i>P</i> ‡	0.03	0.40	

<i>N</i>	Nigella sativa	Placebo	<i>P</i> †
	<i>N</i> = 20	<i>N</i> = 20	
T3 (mmol/l)			
Before	0.92 ± 0.27	1.18 ± 0.36	0.017
After	1.06 ± 0.34	1.16 ± 0.35	0.39
<i>P</i> ‡	0.008	0.15	
T4 (mmol/l)			
Before	8.07 ± 2.56	7.97 ± 3.11	0.91
After	8.89 ± 1.43	7.63 ± 2.23	0.04
<i>P</i> ‡	0.21	0.32	
Anti-TPO (IU/ml)			
Before	294.55 ± 210.05	278.10 ± 170.77	0.78

<i>N</i>	Nigella sativa	Placebo	<i>P</i> †
	<i>N</i> = 20	<i>N</i> = 20	
After	147.99 ± 158.33	274.30 ± 167.20	0.01
<i>P</i> ‡	0.019	0.28	
Nesfatin-1 (ng/ml)			
Before	41.80 ± 28.33	25.86 ± 20.91	0.049
After	37.63 ± 5.91	26.75 ± 23.95	
<i>P</i> ‡	0.34	0.69	
VEGF (ng/L)			
Before	3521.13 ± 395.95	2101.73 ± 339.29	0.17
After	2100.17 ± 36,082	2100.17 ± 360.82	0.25
<i>P</i> ‡	0.02	0.99	

(Farhangi et al. Table 2 metabolic perimeters)

Chinese Herbal Formula

In a study of Chinese herbs used in the treatment of Hypothyroidism it was found that the following formula was effective at normalizing thyroid hormones in 93% of Hashimoto's patients with hypothyroidism: Cyperus, Saussurea, Cnidium, Curcuma and Bupleurum. Modifications were made by adding two separate tonic formulas for different indications. Polygonatum, dioscorea, moutan, hoelen and lycium were used for patients with blood and qi deficiency. Rehmannia Eight Formula was added for patients with Yang deficiency. The Rehmannia Eight Formula is made up of: Radix Ginseng, Atractylodis, Scierotium Poriae Cocos, Radix Glycyrrhizae, Processed Radix Rehmanniae, Radix Albus Paeoniae Lactiflorae, Radix Angelicae Sinensis, Rhizoma Ligustici Chuanxiong (Dharmananda). The amounts of formula used and the proportions of the herbs were not stated.

Case Study

33 yr old female client with Hashimoto's hypothyroidism with no other diagnosis or known pathology. All bloodwork aside from thyroid panel is normal.

History:

Diagnosed with Hashimoto's in 2007. Used conventional medicine until 2014. In 2014 began using Traditional Chinese Medicine (TCM) for additional symptom relief. Started using acupuncture treatments 1-2x/month. Was prescribed a Chinese formula of powdered herbs to take 1 tsp 3x/day.

Chinese Formula: Ba Zhen Tang (Eight treasure Decoction) Radix Ginseng, Atractylodis, Scierotium Poriae Cocos, Radix Glycyrrhizae, Processed Radix Rehmanniae, Radix Albus Paeoniae Lactiflorae, Radix Angelicae Sinensis, Rhizoma Ligustici Chuanxiong. (May have been modified slightly to accommodate for individual constitution).

Client experienced complete symptom relief after 3 months of using herbs and acupuncture and a slight drop in TSH (from 3.75 to 1.1.)

In 2016 the client (having previously eliminated gluten and dairy with no change in antibody levels) eliminated Soy. TPO antibody level taken in 2016 was at 177.5. Three months after complete removal of soy, blood work was done again (1 year after 2016 blood work) and TPO antibody level was at 75. Client was informed by Holistic MD that antibodies could potentially fall into normal range with continued elimination of soy.

Client also follows a supplement regimen including: 400 mg/day Magnesium glycinate, 5,000-10,000 IU Vitamin D (depending on season), high quality B complex with active folate, Nordic Naturals Omega 3 complex, intermittent probiotic use and regular intake of Selenium through Brazil nuts. Client also continues to use Chinese herbal formula, although now at about 4oz of fresh decoction a day based on recommendations from DOM.

Conclusion

Hashimoto's can be a complex and mysterious disease. Conventional western medicine approaches Hashimoto's by providing synthetic hormones in place of natural hormones created by the body. However, western medicine has done poorly in addressing the autoimmune components of Hashimoto's and does not seek to address inflammation, intestinal permeability, viruses or other potential root causes or contributors to the disease. Even using natural techniques, it may or may not be possible for a client to see complete remission of Hashimoto's. However, nutritional and herbal therapeutics can address root causes and factors that may be initiating the autoimmune process or contributing to symptoms. A complete protocol for Hashimoto's would include:

- Nutritional repletion.
- Gut healing through: dietary changes, food allergy elimination, nutrient and supplemental focus on barrier function and tissue repair (minerals, Vitamin D, selenium, EFA's, pro and pre-biotics).

- Avoidance of toxic chemicals in both food and environment that have proven to be damaging to thyroid (Mercury, Iodine, etc).
- Herbal gut healing protocol using nutritive, anti-inflammatory and vulnerary herbs.
- Herbal protocol individually designed for the client. May include: anti-virals, adaptogens, Cordyceps, Nigella Sativa, immune modulating herbs or Traditional Chinese herbs.

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