TRACE ELEMENTS, INC.
Newsletter
VOLUME 12 JAN/APRIL 2000 NUMBER 1

Hair Trace Elements and Hypothyroidism

----- David L. Watts, Ph.D., Director of Research ----------

As a Clinical Psychologist and Licensed Nutritional Consultant, Dr. Malter has a unique and keen insight into the psychophysiology of stress and its reflection in TMA patterns. His experience of using TMA for evaluating the mind/body interaction spans over 20 years. An excellent point is raised by his commentary, in that a majority of people experiencing physical and emotional problems falls outside the “medical/disease” model. They can be classified as having sub-clinical conditions, i.e. falling within the normal medical ranges, but experiencing real physical and emotional symptoms. This is particularly true in relation to thyroid dysfunction.

As Dr. Malter mentioned we often see patients with many of the classic symptoms of hypothyroidism, particularly depression, yet their thyroid function may show no clinical abnormality according to the “medical/disease” model. The TMA can often provide insight into their subclinical conditions.

Occurrence of Hypothyroidism

It has been estimated by Barnes, et al, that 40 percent of the American population suffers from hypothyroidism and is the most common complaint seen by doctors in this country.[1] This estimation was made over 25 years ago and if we include subclinical hypothyroidism we can conservatively raise this estimation to over 50 percent. Severe clinical hypothyroidism is readily evident from blood tests, however subclinical thyroid insufficiency is not easily detected through normal tests. I have described subclinical hypothyroidism as a syndrome rather than a disease and is characterized by fatigue, depression, cold sensitivity weight gain and changes in the texture of the hair and skin.

Thyroid insufficiency affects females at a greater frequency than males. From our database of over 2000 patients submitted with hypothyroid predominate symptoms, 90 percent were females. The reason for this gender difference has been discussed elsewhere and will not be reviewed here.[2]

Nutrition and the Thyroid

Iodine

There are a number of nutrients that affect the thyroid. The most recognized being iodine. Iodine deficiency is associated with endemic colloid goiter a condition that occurred in areas of low iodine soils prior to its prevention with the introduction of iodized salt. Idiopathic nontoxic goiter is identical to endemic goiter but is not associated with iodine. In fact, iodides can actually reduce all thyroid gland activities by inhibiting thyrotropin possibly by inhibiting the hypothalamus. Reduced thyroid activity is often seen even in the presence of normal iodine levels.[3,4] A great deal of emphasis is placed upon iodine in assessing thyroid status, but there are many other factors that are important.

Iron and Vitamin A

Iron and vitamin A deficiencies are prevalent in areas of endemic goiter, although, iodine intake is adequate. It is now recognized that the response to iodine therapy is ineffective in the presence of iron deficiency. Iron is required for the conversion L-phenylalanine to L-tyrosine and may be reduced by over 50 percent with iron deficiency. Many patients with hypothyroidism respond to vitamin A therapy.[5]

Selenium, Zinc and Chromium

Selenium deficiency can contribute to hypothyroidism due to its involvement in the conversion of T4 to active T3. Selenium is a constituent of the enzyme 1 iodothyronine deiodinase (IDI) an enzyme responsible for the peripheral conversion of T4 to T3 in the liver and kidneys. This enzyme is markedly reduced in selenium deficiency.[6]

Zinc influences the secretion of thyroid stimulating hormone (TSH). Therefore, zinc deficiency or a low zinc to copper (Zn/Cu) ratio can be involved in lowered thyroid expression.

A number of research studies have found an interaction between chromium and thyroid activity. The mechanism is not yet understood, however this association may be explained through TMA patterns.[7]

Thyroid Antagonists

Nutritional

Goitrogens are naturally occurring anti-thyroid substances found in foods that adversely affect the thyroid. These are commonly known foods and therefore will not be discussed here. Other nutritional factors known to inhibit thyroid function include:

Calcium	Vitamin D	Cobalt (B12)
PABA	Molybdenum	Bromine
Copper	Lithium	Lead
Mercury		

Endocrine

Hormones antagonistic to the thyroid.

Estrogen	Insulin	Parathyroid

Drugs

Medications That Reduce Systemic Thyroid Expression.[8]

Drug	Use	Trade Name
Sodium nitroprusside	Anti-Hypertensive	Nipride ®
Phenytoin	Anti-Seizure	Dilantin®
Carbamazepin	Anti-Convulsant	Tegretol®
Fluoxetine	Anti-Depressant	Prozac®
Phenobarbital	Anti-Seizure, Sedative	
Valproic Acid	Anti-Seizure	

TMA Patterns Associated with Decreased Thyroid Expression

The most common metabolic type indicating diminished thyroid activity in TMA patterns is the Slow Metabolic Type 1. This neuroendocrine pattern indicates parasympathetic dominance. The primary TMA ratios found with reduced thyroid activity include:

Elevated Ca/P (> 2.63)	Elevated Ca/K (> 4.2)
Elevated Ca/Mg (>7)	

Reduced Zn/Cu (<8)
Reduced Na/Mg (< 4)
Reduced K/Li (< 2500)
Reduced Fe/Pb (< 4.4)
Reduced Se/Hg (<0.8)

Reduced Fe/Cu (< 0.9)
Reduced K/Co (<2000)
Reduced Ca/Pb (<84)
Reduced Fe/Hg (<22)
Reduced Zn/Cd (<500)

Reduced Zn/Hg (< 200)

Elevation of the Ca/Mg ratio indicates a relative increase in parathyroid hormone as well as insulin production. A reduced Zn/Cu ratio indicates a reduction in progesterone relative to estrogen in the female. The relationship of chromium and thyroid activity could be explained by chromium's effect upon insulin sensitivity. Reducing insulin levels would result in improved thyroid hormone activity. The increased cellular immune response common in the Slow Metabolic type could contribute to thyroid disorders due to an autoimmune response.
The greater the numbers of the above mineral ratios present in a TMA profile, the stronger the tendency toward reduced thyroid expression. It should also be noted that these ratios would be reversed in hyperthyroid conditions.

Psychophysiology of Thyroid Disorders – Brain Hypothyroidism

The relationship between thyroid dysfunction and psychiatric disorders has been recognized for over a century and described in cases of myxedema and cretinism. Depression is one of the major symptoms accompanying hypothyroidism. However, other conditions associated with hypothyroidism accompanying mood disorders include:[8]

Fatigue	Constipation	Loss of Appetite
Excessive Sleep Pattern	Poor Memory	Weight Gain
Cognitive Defects	Decreased Sex Drive	Reduced Interest
Poor Concentration	Reduced Sense of Pleasure	

Fatigue is the most common physical symptom associated with depression and results from a diminished thyroid function. The basal metabolic rate of a person with hypothyroidism can be reduced as much as 40-50 percent below normal. It is therefore not difficult to understand the relationship between thyroid status and the health energy continuum.

The thyroid has a significant role in regulating central nervous system (CNS) development and function, and is known to affect cerebral metabolism in adults.[9] Thyroid hormones regulate brain functions via its interaction with the catecholaminergic system and affects synaptic levels of norepinephrine uptake and its receptors. In most patients suffering from depression, the serum levels of TSH, T4 and T3 are within the normal range. However, even with a normal systemic thyroid status, a patient may actually be suffering from "Brain Hypothyroidism".[10,11] Reduced cerebral thyroid expression could therefore, contribute to a host of psychological symptoms. This would explain why many patients with psychiatric conditions respond well to thyroid support, since there are extensive T3 receptors in the brain. The effectiveness of serotonin reuptake inhibitors (SSRI) such as Prozac® may be effective in some patients due to the drug's effect of increasing the availability of T3 in the brain. Conversely, thyroid hormone increases the brain content of serotonin.[8]

Conclusion

Meng stated that “In the majority of cases, the symptoms of hypothyroidism develop slowly and as a result, they often are not recognized or are misjudged for a long time. In the case of subclinical hypothyroidism, an indication for treatment does not exist in all patients. In cases of doubt, therapy can be initiated and discontinued after 6-12 months when there is no therapeutic effect.”[12]

Early treatment of patients with physical and psychological symptoms of hypothyroidism may help in preventing progression to an overt hypothyroid condition. TMA can provide insight to individual thyroid status and aid in modifying diet and nutritional intake to prevent the long-term and chronic conditions associated with hypothyroidism. Therapy can aid not only in depression but in other thyroid related conditions as well, including, musculoskeletal disorders, fibromyalgia, chronic fatigue, cardiovascular disorders,[13,14] diabetes [15,16] and conditions associated with auto immune responses.

References:

1. Barnes, B. et al. *Hypothyroidism: The Unsuspected Illness*. Harper and Roe Pub. N.Y., 1976
2. Watts, DL. The Nutritional Relationships of the Thyroid. *J. Orthomol. Med.* 4,3, 1989.
3. Mu, L. et al. Endemic Goitre in Central China Caused by Excessive Iodine Intake. *Lancet*, Vol. II, 1987.
4. Zimmermann, M., et al. Persistence of Goiter Despite Oral Iodine Supplementation in Goitrous Children with iron deficiency anemia in Cote d’Ivoire. *Am.J.Clin. Nutr*. 71, 2000.
5. Beard, JL. et.al. Impaired Thermoregulation and Thyroid Function in Iron-Deficiency Anemia. *Am.J.Clin.Nutr*. 52, 1990.
6. Essential Trace Elements and Thyroid Hormones. *Lancet*, Vol. 339, 1972.
7. Interaction of Chromium with Insulin: A Progress Report. *Nutr. Rev*. 56,6, 1998.
8. Hennessey, JV., et al. The Interface Between Thyroid Hormones and Psychiatry. *The Endocrinol*. 6,3, 1996.
9. Smith, CD, Ain, KB. Brain Metabolism in Hypothyroidism Studied with ^{31}P Magnetic-Resonance Spectroscopy. *Lancet* 345, 1995.
10. Jackson, IMD, Whybrow, PC. The Relationship Between Psychiatric Disorders and thyroid dysfunction. *Thyroid Update* 9, 1995.
11. Bauer, MS, Whybrow, PC. Thyroid Hormones and the Central Nervous System in Affective Illness: Interactions That May Have Clinical Significance. *Interg. Psychiatry* 6, 1988.
12. Meng, W. Diagnosis and Therapy of Hypothyroidism in Adulthood. *Z Arztl. Fortbild*. 90,1, 1996.
13. Perk, M, O’Neill, BJ. The Effect of Thyroid Hormone Therapy on Angiographic Coronary Disease Progression. *Canadian J. Cardiol*. 13, 1997.
14. Kinlaw, WB. Thyroid Disorders and Cholesterol: Identifying the Realm of Clinical Relevance. *The Endocrinol*. 5,2, 1995.
15. Gray, RS, et al. Hypercholesterolemia in Diabetes with Clinically Unrecognized Primary Thyroid Failure. *Horm. Metab. Res*. 13, 1981.
16. Danforth, E. The Role of Thyroid Hormones and Insulin in the Regulation of Energy Metabolism. *Am.J. of Clin. Nutr*. 38, 1983.

Copyright 2000, Trace Elements, Inc. All Rights Reserved