

The Complete Thyroid Profile



The Problem

Thyroid disease or dysfunction can explain a wide variety of symptoms, yet it is notoriously underdiagnosed. Population studies such as the Colorado Thyroid Disease Prevalence Study¹ demonstrate that up to 10% of Americans may have thyroid dysfunction, defined as abnormal levels of thyroid-stimulating hormone (TSH).

Overt hypothyroidism, with its characteristically high TSH and low circulating thyroxine (T4) levels, or hyperthyroidism, with low TSH and high T4 levels (most commonly manifested as Graves' Disease), are relatively easy to recognize clinically. But an elevated TSH associated with normal thyroid hormone levels, defined as "subclinical" hypothyroidism, is thought to be present in 4-10% of the general population and in up to 20% of women over 60 years old, while a low TSH and normal thyroid hormone levels, or subclinical hyperthyroidism, occurs in about 2% of the population and is most common in women, blacks, and the elderly².

Thyroid hormones are primarily involved in directing the metabolic activity of cells, and a properly regulated thyroid is therefore essential to a wide array of biochemical processes in the body. Subclinical hypo- and hyperthyroidism can therefore result in symptoms even when hormone levels appear to be normal³, because the abnormal TSH indicates that there is still a disorder in thyroid regulation, and because thyroid hormone activity can be affected by interactions with other hormone systems, particularly estrogens and cortisol, and by some nutritional deficiencies. Management of thyroid dysfunction requires an understanding of these interactions and careful monitoring of treatment with regular thyroid function tests⁴⁻⁷.

The presence of thyroid peroxidase (TPO) antibodies has been found to help diagnose thyroid disease in patients with abnormal TSH and/or mild thyroid symptoms⁸⁻¹⁰, and is used to indicate the presence of autoimmune thyroiditis (Hashimoto's disease, the most common cause of overt hypothyroidism), since 95% of such patients are positive for TPO antibodies⁴.

Symptoms of Thyroid Dysfunction

- weight gain or loss
- irregular bowel habits
- sleep disturbances
- menstrual irregularities
- dry/brittle hair and nails
- high blood pressure
- heat or cold intolerance
- fatigue
- hair loss
- water retention
- infertility
- depression
- hyperlipidemia
- muscle and joint pain

Which Tests are Included in the Complete Thyroid Profile?

TSH – Thyroid Stimulating Hormone

TSH is produced by the pituitary and acts on the thyroid gland to stimulate production of T4. Higher than normal TSH can indicate a disorder of the thyroid gland, while low TSH can indicate over-production of T4, which acts in a negative feedback on the pituitary to reduce TSH production. Low TSH can also be caused by problems in the pituitary gland itself, which result in insufficient TSH being produced to stimulate the thyroid (secondary hypothyroidism).

Free T4 – Thyroxine

The predominant hormone produced by the thyroid gland. An inactive hormone, T4 converts to T3 within cells. Free T4 is the non-protein-bound fraction of the T4 circulating in the blood, representing about 0.04% of the total circulating T4, which is available to tissues. Low TSH combined with low T4 levels indicates hypothyroidism, while low TSH and high T4 levels indicates hyperthyroidism. High TSH and low T4 indicates a thyroid gland disease, such as thyroiditis.

Free T3 – Triiodothyronine

The active thyroid hormone that regulates the metabolic activity of cells. Free T3 is the non-protein-bound fraction circulating in the blood, representing about 0.4% of the total circulating T3, which is available to tissues. Elevated T3 levels are seen in hyperthyroid patients, but levels can be normal in hypothyroid patients.

(continued on back)

TPO – Thyroid Peroxidase Antibodies

Thyroid peroxidase is an enzyme used by the thyroid gland in the manufacture of T4. In patients with autoimmune thyroiditis (predominantly Hashimoto's disease), the body produces antibodies that attack the thyroid gland, and levels of these antibodies in blood can diagnose this condition and indicate the extent of the disease.

Advantages of a Simple Blood Spot Test

- No phlebotomist or centrifuging required, therefore less expensive and more convenient than conventional blood draws
- Nearly painless finger stick is used to collect the few drops of blood required
- Private and convenient for both patient and health care provider
- Hormones and other analytes are stable in dried blood spot at room temperature for weeks, allowing for world-wide shipment
- Safe handling and transport of samples, as infectious agents are destroyed by drying

Clinical Utility

- The Complete Thyroid Profile combines the four most clinically useful thyroid function tests, giving a thorough assessment of a patient's thyroid function compared with monitoring TSH alone
- Free hormone levels are measured, not calculated from indirect assays
- ZRT has taken an innovative step in following the laboratory guidelines suggested by the American Association of Clinical Endocrinologists for a tighter TSH range
- This easy, comprehensive screening tool can mean the difference between guesswork and an elegant treatment plan
- Combined with ZRT's saliva or blood spot tests for other hormones, the Complete Thyroid Profile allows a comprehensive assessment of endocrine interactions between the sex, thyroid, and adrenal hormones. Since hormonal symptoms commonly mimic each other, this assessment allows for a true evaluation of a patient's hormonal disorders

References

1. Canaris GJ, Manowitz NR, Mayer G, Ridgway EC. The Colorado thyroid disease prevalence study. *Arch Intern Med* 2000;160:526-34.
2. Gharib H, Tuttle RM, Baskin HJ, Fish LH, Singer PA, McDermott MT. Subclinical thyroid dysfunction: a joint statement on management from the American Association of Clinical Endocrinologists, the American Thyroid Association, and the Endocrine Society. *J Clin Endocrinol Metab*. 2005;90:581-5; discussion 586-7.
3. McDermott MT, Ridgway EC. Subclinical hypothyroidism is mild thyroid failure and should be treated. *J Clin Endocrinol Metab* 2001;86:4585-90.
4. American Association of Clinical Endocrinologists. Medical guidelines for clinical practice for the evaluation and treatment of hyperthyroidism and hypothyroidism. AACE Thyroid Task Force. http://www.aace.com/pub/pdf/guidelines/hypo_hyper.pdf (accessed 2/11/08).
5. Alevizaki M, Mantzou E, Cimponeriu AT, Alevizaki CC, Koutras DA. TSH may not be a good marker for adequate thyroid hormone replacement therapy. *Wien Klin Wochenschr* 2005;117:636-40.
6. Diez JJ. Hypothyroidism in patients older than 55 years: an analysis of the etiology and assessment of the effectiveness of therapy. *J Gerontol A Biol Sci Med Sci* 2002;57:M315-20.
7. Meier C, Trittbach P, Guglielmetti M, Staub JJ, Müller B. Serum thyroid stimulating hormone in assessment of severity of tissue hypothyroidism in patients with overt primary thyroid failure: cross sectional survey. *BMJ* 2003;326:311-2.
8. Banovac K, Zakarija M, McKenzie JM. Experience with routine thyroid function testing: abnormal results in "normal" populations. *J Fla Med Assoc* 1985;72:835-9.
9. Bjøro T, Holmen J, Krüger O, Midthjell K, Hunstad K, Schreiner T, Sandnes L, Brochmann H. Prevalence of thyroid disease, thyroid dysfunction and thyroid peroxidase antibodies in a large, unselected population. The Health Study of Nord-Trøndelag (HUNT). *Eur J Endocrinol* 2000;143:639-47.
10. Sakaiharu M, Yamada H, Kato EH, Ebina Y, Shimada S, Kobashi G, Fukushi M, Fujimoto S. Postpartum thyroid dysfunction in women with normal thyroid function during pregnancy. *Clin Endocrinol (Oxf)* 2000;53:487-92.

Useful Resources:

American Thyroid Association – www.thyroid.org

Arem R. *The Thyroid Solution*. New York, NY: The Ballantine Publishing Group; 1999

Brownstein D. *Overcoming Thyroid Disorders*. West Bloomfield, MI: Medical Alternatives Press; 2002

Moore EA, Moore L. *Graves' Disease – A Practical Guide*. Jefferson, NC: McFarland & Company; 2001

Shames RL, Shames KH. *Thyroid Power: Ten Steps to Total Health*. New York, NY: HarperCollins Publishers Inc.; 2001

Shomon MJ. *Living Well with Hypothyroidism – What your Doctor Doesn't Tell You – What You Need to Know*. New York, NY: HarperCollins Publishers Inc.; 2000