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## Customized Therapy for Thyroid Imbalance

### Thyroid Hormone: T4-T3 Combination Therapy

Thyroid Hormone (TH) exists in two major forms: thyroxine (T4), an inactive form that is produced exclusively by the thyroid gland; and triiodothyronine (T3), the active form of thyroid hormone. About 20 percent of T3 is produced by the thyroid gland, with the remainder produced through conversion of T4 in various tissues of the body when more T3 is needed. Some people may transform T4 into a non-usable form known as Reverse T3. Others, known as “poor T4 converters” have “difficulty converting inactive thyroid hormone (i.e., T4) into the more active thyroid hormone (T3)... many individuals do not adequately convert T4 into T3 [and therefore suffer from] many of the signs of hypothyroidism, such as fatigue, poor immune system functioning, headaches, coldness, weight gain, etc. Many things contribute to a poor conversion problem including old age, vitamin and mineral deficiencies, heavy metal toxicities (e.g., mercury, lead, nickel and aluminum), adrenal problems, other hormonal imbalances... antibodies to the enzyme that converts T4 to T3 and infections and depression... Many commonly prescribed drugs have also been shown to lower this conversion including birth control pills, synthetic estrogen products and beta-blockers.” [Overcoming Thyroid Disorders. 2nd Edition. David Brownstein, MD. p. 217]

TH helps control heart rate and blood pressure and therefore TH imbalance has a profound effect on cardiovascular fitness. When TH levels drop, the liver no longer functions properly and produces excess cholesterol, fatty acids, and triglycerides. Hypothyroidism is the second leading cause of high cholesterol after diet. High cholesterol may also increase the risk of Alzheimer’s disease, and severe hypothyroidism can cause symptoms similar to those of Alzheimer’s disease.

Although the most common treatment for hypothyroidism is levothyroxine, a study published in December 2009 in the European Journal of Endocrinology evaluated quality of life, depression and anxiety rating scales and patients’ preferences and concluded that a combination of T4/T3 is superior to treatment with only T4 (levothyroxine) for hypothyroidism.

Some previous studies have shown the superiority of the combination therapy while others have found no difference. This inconsistency has led some experts to conclude that there is no benefit of using T3 for thyroid hormone therapy. Although some practitioners site the risk of side effects as a reason not to use T3, the above mentioned study replaced part of the T4 dose with 20 mcg of T3 and showed that there was no difference with regard to side effects. According to the authors, during the T4/T3 combination therapy, five people experienced side effects including palpitations, excessive sweating, and psychological

instability. During the T4-only therapy, nine people reported the same side effects.

Synthetic T3 (liothyronine) is commercially available only as an immediate-acting preparation, which may cause undesirable side effects including heart palpitations in the recommended dose of 50-100 mcg. That is why some practitioners choose to use lower doses of T3 or provide T3 as a sustained release preparation, both of which are available from our compounding pharmacy.

Armour Thyroid® (Desiccated Natural Thyroid, Thyroid USP-porcine) is a blend of T4-T3 that is also used to treat hypothyroidism. Many patients prefer Thyroid USP, reporting that they simply do not feel as well when they take levothyroxine alone or with liothyronine. Recently, there has been a nationwide shortage of Armour Thyroid® in some strengths, and the manufacturer has not indicated any date when all strengths of the product will be back on the market.

Currently, Thyroid USP is available in all strengths only through compounding pharmacies. The specifications for Thyroid USP (porcine) powder require that each grain contains levothyroxine (T4) 34.2-41.8 mcg and liothyronine (T3) 8.1-9.9 mcg. This produces a T4:T3 ratio of 4.22:1 to meet the stringent standards for a U.S. Pharmacopeia monograph, with a permissible variance of  $\pm 10\%$ .

***By prescription, we can compound Thyroid USP in the doses that your patients need, and can omit problem-causing fillers and excipients that are found in the commercial product but may not be tolerated by all patients. We welcome your questions and the opportunity to work together to solve medication problems.***

### T3 and LDN for Treatment of Fibromyalgia

Dr. Ian Carroll, MD, MS, and Dr. Jarred Younger, PhD, of the Stanford Systems Neuroscience and Pain Lab are conducting a clinical trial to investigate the use of T3 and Low Dose Naltrexone (LDN) for the treatment of fibromyalgia. Fibromyalgia Syndrome is a common and potentially debilitating condition that can negatively impact every area of a person's life. The primary complaint of those with fibromyalgia is widespread body pain and muscle tenderness. Most people who have fibromyalgia also experience fatigue and have trouble sleeping. Little is known about the disorder, and there is still a great need for effective treatments. There is significant overlap between the symptoms of hypothyroidism and fibromyalgia, chronic fatigue and depression. Hypothyroid patients who have been treated with T3 have experienced some improvement in symptoms of fibromyalgia.<sup>1</sup>

In a single-blind, crossover trial at the Division of Pain Management, Stanford University, LDN reduced fibromyalgia symptoms in ten women meeting criteria for fibromyalgia, with a greater than 30% reduction of symptoms over placebo. In addition, laboratory visits showed that mechanical and heat pain thresholds were improved by the drug. Side effects (including insomnia and vivid dreams) were rare, and described as minor and transient. Baseline erythrocyte sedimentation rate predicted over 80% of the variance in drug response. Individuals with higher sedimentation rates (indicating general inflammatory processes) had the greatest reduction of symptoms in response to low-dose naltrexone.<sup>2</sup> The Stanford Systems Neuroscience and Pain Lab has enrolled patients for a clinical trial investigating LDN for the treatment of fibromyalgia.

<sup>1</sup> <http://snapl.stanford.edu/t3/> Accessed Aug 18, 2010

<sup>2</sup> Pain Med. 2009 May-Jun;10(4):663-72.