Switching Desiccated Thyroid to Levothyroxine: Dose Conversion

When switching from desiccated thyroid to single entity levothyroxine products desiccated thyroid (T3+T4) 60 mg is considered approximately equivalent to levothyroxine (T4) 0.1 mg. After switching to levothyroxine, serum TSH should be measured in six weeks and the dose adjusted as necessary. (1)

Table 1: Equivalent doses of desiccated thyroid and levothyroxine

Desiccated Thyroid (T3 + T4) (derived from porcine thyroid gland)	T4 (levothyroxine)
30mg	50μg (approximate range 25μg - 88μg)
60mg	100μg (approximate range 88μg - 112μg)
90mg	150μg (approximate range 112μg - 175μg)
125mg	200μg (approximate range 175μg - 300μg)

Review of thyroid replacement therapy

The goal of thyroid replacement therapy is to restore the patient to a euthyroid state. This can usually be accomplished by replacement with synthetic thyroid hormone, levothyroxine (T4, thyroxine). Levothyroxine is a prohormone with very little intrinsic activity. It is converted to the active metabolite triiodothyronine (liothyronine,T3) in peripheral tissues.

T4 is readily absorbed and has a half-life of approximately 7 days. Once a day dosing results in constant serum levels of T4 and T3 when steady state is reached, which may take 6 weeks or longer.

Synthetic T3 has a shorter half-life than T4 - approximately 2.5 days. When included with T4 in combination products for once a day dosing, this can cause fluctuations in T3 levels. Results of these fluctuations can lead to overdosing and cardiovascular adverse events.

The 2014 American Thyroid Association (ATA) guidelines indicate there is insufficient evidence to support the routine use of a combination of T4 and T3 therapy in patients unsatisfied with T4 monotherapy.(1)

With T4 supplementation, symptoms of hypothyroidism including fatigue, muscle cramps, constipation, dry skin, cold intolerance and menstrual irregularities may start to resolve in about 2 weeks, but can take several months depending on the severity of the condition.

Fetal brain development is dependent on maternal free T4 concentration until week 16 to 18 of gestation. Excessive T3 can cause impaired neurological development in the fetus. Women

planning to become pregnant should take this in to consideration if they are on a combined T4/T3 dosage form. (1)

Combination products, such as thyroid preparations made from desiccated pig thyroid glands, contain both T4 and T3. The ratio of T4 to T3 in these preparations is about 4:1, which is significantly lower than the 14:1 ratio of secretion by the human thyroid gland. (2)
Along with T4 and T3, desiccated thyroid extract contains other molecules present in the thyroid gland of the animal. There is no evidence that these substances are required by humans, remain stable in the tablet production, survive the gastrointestinal tract, or reach adequate blood levels. (3)

Thyroid stimulating hormone (TSH) level is the screening test for hypothyroidism and it is also used to adjust the levothyroxine dose. If TSH is within normal limits, T4 levels will also be within normal limits; however, T3 levels may be low.

Table 2: Normal thyroid lab values

Thyroid Screen Test (serum, plasma)	Reference Intervals (SI Units)
TSH (Thyroid Stimulating Hormone)	0.35 – 5.0 mU/L
T4 (Free thyroxine)	12 – 30 pmol/L
T3 (Free triiodothyronine)	3.7 – 6.5 pmol/L

Combination therapy with T4 and T3 (ratio T4:T3 of about 14:1) is not usually recommended, although it might be reasonable to try for select patients. Candidates for a trial of combination therapy would be those who do not recover well after thyroidectomy or radioiodine ablation, and those who have a T3 level at or below the lower reference range. (1)

Some people will continue to have symptoms, even when their laboratory values are normal. In most cases, the reason is non-compliance or administration with food or other medications that affect absorption of levothyroxine. (3)

A small percentage of people may have thyroid hormone resistance. For treatment of refractory hypothyroidism, adding synthetic liothyronine to synthetic levothyroxine in physiologic ratios is an option. Use single entity products rather than combinations because liothyronine should be dosed twice daily. (3, 4)

Most patients with little or no thyroid function (e.g. after ablation therapy) will require about 1.6 mcg/kg ideal body weight. The range may vary from 50 - 200mcg/day, depending on such parameters as body fat, age and gender. T4 requirements usually correlate better with lean body mass than total body weight. (3) Extra caution should be used when initiating treatment in

older patients and in those with coronary heart disease. A lower starting dose of 25 to 50 mcg daily is recommended with upward titration based on tolerability.

T4 should be taken on an empty stomach, ideally 30 minutes to an hour before breakfast. (1) However if this interferes with compliance, it may be taken with breakfast and the dose increased as necessary to make up the amount of drug lost due to binding with food.

Prepared by J. Macpherson BSP; reviewed by K. Jensen MSc, BSP
medSask, August 2017

References:

1) Ross, DS. Treatment of primary hypothyroidism in adults. In: UpToDate, Cooper, DS, (Ed), UpToDate, Waltham, MA. (Accessed on June 23, 2017.)
2) Guidelines for the Treatment of Hypothyroidism. Prepared by the American Thyroid Association Task Force on Thyroid Hormone Replacement. THYROID. Volume 24, Number 12, 2014. American Thyroid Association. DOI: 10.1089/thy.2014.0028
3) PL Detail-Document, Treatment of Hypothyroidism: When Levothyroxine Fails. Pharmacist's Letter/Prescriber's Letter. January 2015.
4) PL Detail-Document, Desiccated thyroid vs. synthetic thyroid supplementation. Pharmacist's Letter/Prescriber's Letter. October2008.