



Spring 5-10-2020

## Levothyroxine Versus Dessicated Bovine Thyroid (Armour Thyroid) Treatment in Hypothyroidism

Christine Zaki  
christine.zaki@und.edu

Follow this and additional works at: <https://commons.und.edu/nurs-capstones>

---

### Recommended Citation

Zaki, Christine, "Levothyroxine Versus Dessicated Bovine Thyroid (Armour Thyroid) Treatment in Hypothyroidism" (2020). *Nursing Capstones*. 318.  
<https://commons.und.edu/nurs-capstones/318>

This Independent Study is brought to you for free and open access by the Department of Nursing at UND Scholarly Commons. It has been accepted for inclusion in Nursing Capstones by an authorized administrator of UND Scholarly Commons. For more information, please contact [und.common@library.und.edu](mailto:und.common@library.und.edu).

Levothyroxine Versus Desicated Bovine Thyroid (Armour Thyroid) Treatment in  
Hypothyroidism

Christine Zaki

The College of Nursing: North Dakota University

NURS 997: Family Nurse Practitioner Independent Study

Dr. Jackie Roberts

May 5, 2020

## PERMISSION

Title: Levothyroxine Verses Desiccated Bovine Thyroid (Armour Thyroid) in The Treatment of Hypothyroidism

Department: Nursing

Degree : Master of Science

In presenting this independent study in partial fulfillment of the requirement for a graduate degree from the University of North Dakota, I agree that the College of Nursing & Professional Disciplines of this University shall make it freely available for inspection. I further agree that permission for extensive copying or electronic access for scholarly purposes may be granted by the professor who supervised my independent study work or, in his/her absence, by the chairperson of the department or the dean of the Graduate School. It is understood that any copying or publication or other use of this independent study or part thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to the University of North Dakota in any scholarly use which may be made of any material in my independent study.

Signature \_\_\_\_\_Christine Zaki\_\_\_\_\_

Date \_\_\_04/03/2020\_\_\_\_\_

### **Abstract**

The standard treatment of hypothyroidism is with levothyroxine (LT4). In the humans, the LT4 activates T4 to triiodothyronine (T3). However, there is a reported evidence that desiccated bovine thyroid (Armour Thyroid) is a better option as it has fewer side effects, though T3 is not fully reinstated in LT4-treated patients. On the other hand, desiccated thyroid extract (DTE) is a form of combination therapy in which the LT4/LT3 ratio is 4:1; the mean daily dose of DTE required to standardize serum TSH contains 11 mcg T3, but some patients may require higher doses. DTE does not have formal oversight by the FDA and reliability of T4 and T3 contents is supervised only by the manufacturers (T et al., 2020). The purpose of this paper is to evaluate the efficacy of levothyroxine and comparison to DTE to guide the treatment of a 42-year-old female diagnosed with hypothyroidism. Currently, levothyroxine is a drug of choice in managing hypothyroidism. However, research will be reviewed to determine whether this intervention is the better choice or considerations should be made to switch to DTE. Finding suggest levothyroxine monotherapy itself has proven to manage hypothyroidism while there is no significant effect in adding DTE in management of hypothyroidism.

## Background

According to Armstrong et al. (2019), hypothyroidism is known to be a condition whereby the thyroid gland produces inadequate thyroid hormone. The major cause of hypothyroidism is autoimmune thyroiditis, an inflammation that affects thyroid gland cells causing damage. This may cause the patient's own immune system to weaken. It affects a large number of cells of the thyroid gland thus, less production of the thyroid hormones (West & Felz, 2020). Signs and symptoms of hypothyroidism include "fatigue, weakness, weight gain or increased difficulty losing weight, coarse dry hair, dryness, rough pale skin, hair loss, cold intolerance, muscle cramps as well as frequent muscle aches, constipation, depression, irritability, memory loss, abnormal menstrual cycles, and decreased libido" (West & Felz, 2020). In general hypothyroidism is defined as an endocrine disorder with under-production of thyroid hormone (Armstrong et al., 2019).

Evidence indicates that a large population is affected with hypothyroidism and it is common especially in women and older adults (Halawani, et.al., 2018). According to (Udovcic et al., 2017), hypothyroidism affects approximately four to ten percent of the American population while the prevalence of subclinical hypothyroidism is reported to be as high as ten percent. West and Felz (2020) report that, up to ten percent of women might experience some sort of deficiency of thyroid hormone. Hypothyroidism contributes to heart diseases as it affects cardiac contractility, and causes destruction of cardiac muscle relaxation, which relates to diastolic hypertension and coexistent coronary artery disease (Udovcic et al., 2017). Thyroid hormones are important in regulating cardiac, vascular, and metabolic physiology (Udovcic et al., 2017).

In the studies, Ungvarsky (2019); Bragg et al. (2020) found that most cases of hypothyroidism are treated with the use of Synthroid a synthetic compound identical to T4

(levothyroxine) produced by the human thyroid gland. In comparison Armour Thyroid a natural product made from animal thyroid glands. The purpose of this paper is to address the question whether patients diagnosed with hypothyroidism disease who are taking treatments or those requiring the treatment for hypothyroidism would benefit more with levothyroxine compared to DTE and whether the levothyroxine monotherapy will lead to overall better outcome over time? Is there enough evidence to suggest that one drug is better than the other? Levothyroxine (LT4) contain T4 which activates T4 to triiodothyronine (T3), opposite with DTE which has a combination therapy of LT4/LT3 (Bragg et al., 2020). In the case of a 42 years old female who presented with fatigue, dry skin, weight gain, and sensitivity to cold, as well as the office labs that exhibited TSH level of 7.0 and T4 of 0.25, she was started on levothyroxine 25mcg daily with a follow up in four weeks. Further research will be conducted to obtain an evidence-based recommendation that will guide the decision making whether to continue with levothyroxine or to switch her to DTE.

### **Case Report**

This was a 42 years-old Caucasian female who presented with the complaints of generalized increased sensitivity to cold, fatigue, dry skin, and weight gain. She stated that she has been using over the counter moisturizing creams with no improvement to her dry skin. She also reports gradual weight increase despite no change in her exercise level or eating habits over the course of three months. She reported decrease level of energy leading to decrease productivity at work despite the longer sitting hours in the Information Technology department. She noticed lack of motivation to exercise. She denied shortness of breath, fever/chills, being polyuria, polydipsia or dry mouth, hair loss, constipation, or irregular menses.

Medical history revealed that she is currently taking multivitamin one tablet daily and probiotics over the counter. She also reported that she is married with two children. She denied any medical problems. Her family history included diabetes and hypertension. History of surgical procedure was only the wisdom tooth extraction years ago. Physical exam was unremarkable with blood pressure 130/80, pulse of 76, temperature of 97.8 °F, and respiratory of 16. She was well groomed and appropriately dressed for the weather, appearing healthy, alert, and oriented to place, person, time, and situation with no identified distress. Ear canals and tympanic membrane 's normal and nose and mouth without ulcers or lesions as assessed using otoscope. No adenopathy, no asymmetry, masses, or scars noted and no enlargement of the thyroid gland to palpation. Lungs clear to auscultation, no rales, rhonchi, or wheezes to both upper and lower posterior and anterior lobes. Regular heart rate and rhythm with normal S1 S2, no S3 or S4 and no murmur, click, or rub noted. The abdomen was soft, nontender, no masses and bowel sound active both quadrants. Denied any symptoms of urinary tract infections or any genitourinary abnormalities. Extremities normal, no gross deformities noted, no evidence of inflammation in joints, full range of motion in all extremities. Skin was dry with no suspicious lesions or rashes. Neurological exam was unremarkable as evidenced by cranial nerves 1-12 normal and intact mentation and a normal speech. She denied any personal history of psychiatric disorders or diagnosis. She denied any history of bleeding or clotting disorder. No Known Drug Allergies.

Office diagnostic test, BHcg was negative, urinary analysis that was normal, complete blood count with differential that was normal, metabolic panel that was normal, TSH level of 7.0, and T4 of 0.25. Based on this assays and clinical manifestations this patient was diagnosed with hypothyroidism (E03.9). The treatment plan was a levothyroxine (Synthroid) 25 mcg po

daily with follow up for TSH level check in 4 to 6 weeks. In summary this patient is a new patient who presented with increased sensitivity to cold and feeling fatigue for the past 3 months with weight gain and dry skin. Blood work indicated increased TSH levels suggesting hypothyroidism.

### **Literature Review**

Based on the studies, the major difference between levothyroxine vs DTE is that levothyroxine contains T4 only while desiccated bovine thyroid has T4 and T3 (Bragg et al., 2020). To clear uncertainty whether the addition of triiodothyronine (T3, Cytomel) found in DTE adds additional benefit to thyroid replacement with thyroxine in treating hypothyroidism literature review will be reviewed. This is equally important for further understanding the management of hypothyroidism to avoid complications that are associated with undertreatment or overtreatment. In some cases, patients who are inadequately treated for hypothyroidism are a high risk for cardiac diseases. In addition, increased risk of osteoporosis and atrial fibrillation over-replacement of thyroxine is seen in some patients as well (Shim et al., 2019). In comparison of levothyroxine vs DTE in management of hypothyroidism several articles will be evaluated.

In a randomized, double-blind, crossover study at a tertiary care center a study conducted on 70 patients ages 18-65 years with a primary diagnose of hypothyroidism was studied (Hoang, et al., 2016). These patients previously were treated with DTE then they were switched to levothyroxine and their TSH levels was monitored during the treatment course. The aim of the study was to examine the effectiveness of DTE compared to levothyroxine among the hypothyroidism patients. The study was conducted in a period of six months and based on the results it was concluded that there was no deference in efficacy between the two drugs. The patients who were placed on DTE treatment lost 3 pounds. The patients who were previously

treated with DTE, did not feel as well despite adequate dose based on serum TSH levels after being transferred to levothyroxine. Nearly half of the patients in the study preferred DTE over levothyroxine (Hoang, et al., 2016).

Shomon (2019) completed an online survey that was comprised of 12,146 patients who were receiving treatment for hypothyroidism with either levothyroxine alone, levothyroxine combined with liothyronine (T3), or DTE. Report indicated that the patients who were taking DTE were more content with their treatment than those who were on the other two types of therapy (Shomon, 2019). In addition, DTE group described less difficulties with fatigue, weight, and memory, than the other two groups (Shomon, 2019). Participants also reported an improvement in mood and mental symptoms (Shomon, 2019). Additionally, no improvement in body pain, depression, anxiety, quality of life, or body weight in treatment with T4 compared to DTE in a 2006 meta-analysis of 11 randomized trials with a total of 1216 patients (Shomon, 2019).

Another study was compared levothyroxine to DTE in terms of thyroid blood tests, the factors that were considered included changes in weight, psychometric test results and patient preference (American Thyroid Association, 2020). An improvement in symptoms with DTE was noted among those patients who continued to experience symptoms of hypothyroidism while on levothyroxine when they were shifted to DTE (American Thyroid Association, 2020). The report indicated that forty nine percent of the patients preferred DTE, nineteen percent preferred levothyroxine and twenty three percent had no preference (American Thyroid Association, 2020). Again, many patients preferred this DTE option as compared with levothyroxine. No differences in thyroid function blood test and psychometric test results, although DTE indicated some weight loss (American Thyroid Association, 2020).

A cross-sectional survey in 2015 encompassed 337 patients of Lebanese whereby the patients were requested to fill the questionnaire in a community setting approached by the pharmacist during their visit to obtain levothyroxine drug (El Helou et.al., 2019). The aim of the study was to assess treatment adherence to levothyroxine therapy as well as the knowledge of these patients regards their disease and treatment therapy including factors concerning their adherence to treatment (El Helou et.al., 2019). The study was to provide a complete understanding to healthcare providers in improving levothyroxine adherence, understanding the draw back and contributing factors was to give insight of levothyroxine for better management (El Helou et.al., 2019). Many factors were identified to affect adherence, such as higher monthly income, comorbidities, history of thyroidectomy. Patients in this study, did not report side effects or negative effectiveness with the use of levothyroxine (El Helou et.al., 2019).

In another randomized study on levothyroxine treatment for subclinical hypothyroidism, finding discouraged routine use of levothyroxine on adults 80 years and older (Peeters et al., 2019). The trials were done between April 2013 and May 2018, with final follow up May 4, 2018. In another study levothyroxine treatment was compared with placebo, symptoms such as fatigue and did not significantly affect the outcome (American Thyroid Association, 2020). When comparing levothyroxine and DTE dosing, there is a huge problem due to lack of standardization for each batch to be administered (Mooijaart et al., 2019). The preparations of DTE do not dose strength in milligrams, but relatively in grains of thyroid (Mooijaart et al., 2019).

According to Udovicic et al.(2017), there is no actual known of the milligram equivalent in each dose, Natural vs. Synthetic Thyroid Medications for Thyroid. Lastly, DTE is not recommended for older adults. It is considered high risk in those older than 65 years by

government health groups. Medicare does not cover it due to its dangerous in causing atrial fibrillation in older people with heart problems (Udovicic et al., 2017).

The impact of addition of T3 is minimal in managing hypothyroidism. According to T et al. (2020), in a study with elderly patients, issues with persistent neurocognitive dysfunction would benefit from the addition of T 3 at a dose of 125 mcg, with a simultaneous decrease in the T 4 dose of 50 mcg in comparison to younger patients ages 29-44. The study failed to find any benefits of partial T 3 substitution while the doses of T 4 was sufficient to reestablish TSH levels to normal levels (T et al., 2020). The study concluded that routine use of T 3 cannot be recommended, but it be can be used on elderly patients with lingering confusion, depression, or slow mentation along with the adequate doses of T 4 (T et al., 2020). American Thyroid Association and European Thyroid Association recommend a trial of combination therapy for patients on single therapy with thyroxine alone who are continually discontented with their therapy (T et al., 2020).

In a survey addressing the treatment of hypothyroidism with American Thyroid Association (ATA) members, involved physicians who presented with thirteen theoretical patients and treatment options included levothyroxine, synthetic combination therapy, thyroid extract, and liothyronine monotherapy Ungvarsky (2019). The purpose was to analyze prescribing levothyroxine monotherapy vs. any T3 therapy. The factors considered were control of time and physician characteristics choice of therapy and the country of practice. The survey concluded that current North American guidelines do not recommend combination therapy (Jacqueline et al., 2019). According to Ungvarsky (2019); Bragg et al. (2020), levothyroxine is one of the most repeatedly prescribed drugs that is considered the primary treatment around the world for hypothyroidism related to low production of thyroxine among patients (Bragg et al.,

2020). It is also utilized to replace the natural hormone in patients whose thyroid gland has been removed in conditions like cancer (Halawani, 2018). According to McAninch and Bianco (2019), levothyroxine monotherapy is favored because of less safety concerns and its efficacy to stabilize the TSH serum levels.

Finally, natural thyroid preparations (DET) were the first pharmacologic treatments accessible with a reported thyrotoxic adverse effects and issues with inconsistencies in the strength of the tablets surfaced (McAninch & Bianco, 2016). In addition, it was discovered that some contained anywhere from double to no visible metabolic activity, and other concerns the shelf-life of desiccated tablets was limited especially with moist conditions impacting treatment not responding to desiccated thyroid altogether due to inactive thyroid hormone (McAninch & Bianco, 2016). Because of the mentioned problems the reputation of natural thyroid products was blemished because there was hesitation to use levothyroxine monotherapy in fear of resulting T3 deficiency but it was discovered later that prescribing T4 there was conversion to T3 (McAninch & Bianco, 2016). This set the foundation for treatment with levothyroxine in replacing thyroid hormone to in hypothyroidism with the aid of TSH radioimmunoassay a major shifted toward levothyroxine monotherapy as first-line therapy (McAninch & Bianco, 2016). TSH offered the first sensitive and specific marker of systemic thyroid hormone status. Clinicians use TSH levels to titrate therapy to achieve normal levels of serum. In contrast, desiccated thyroid resulted in a T3 peak about 2 to 5 hours after administration that related to thyrotoxic symptoms in some patients. A single daily dose of levothyroxine develops in stable blood levels of T4 and T3 throughout the day. This gave weight in using levothyroxine over DTE (McAninch & Bianco, 2016).

### **Analysis/ Conclusion**

Studies indicate benefit of weight loss with the use of DTE. Findings also indicate large numbers of patient preferred the use of DTE when comparing with levothyroxine based on symptoms experienced. (Hoang et al., 2013; (American Thyroid Association, 2020); Udovicic et al., 2017). Several impediments were witnessed with DTE. It was discovered that there is a high risk with the use of DTE when compared to levothyroxine in adults over the age of 65 years with heart problems (Peeters et al., 2019). Moreover, inaccurate dosage is associated with DTE. Furthermore, DTE was developed before the U.S. Food and Drug Administration (FDA) existed (Shomon, 2019). It was among grandfathered prescription, regulated by FDA but, not the same required application process for new drugs introduced to the market (Shomon, 2019).

### **Learning Points**

- No significant improvement with the use of DTE therapy, no increase in quality of life; however, DTE contributed to modest weight loss.
- There is need for educational programs to implemented, doctor-patient and pharmacist-patient relationship could be improved, and new treatment regimens be considered in order to enhance patient adherence.
- Most people do well on the standard treatment of levothyroxine, though some people will have hypothyroid symptoms and/or low T3 levels while taking it, even though their TSH levels are within normal limits.
- Treatment with T4 only appears to be completely sufficient for the great majority of people with hypothyroidism, although some individuals are likely to feel better with combination treatment.

- It is not advisable to use synthetic or natural, thyroid hormones to treat obesity or to help with weight loss. People with normal thyroid function will not benefit from thyroid hormone taking in losing weight. Serious and potentially life-threatening complications with taking too much thyroid hormone or using it along with other weight loss drugs.
- DTE is considered high risk in those older than 65 years by government health groups. It is also, not covered by Medicare due to it dangerous in causing atrial fibrillation in older people with heart problems.

## References

- American Thyroid Association. (2020). Clinical thyroidology for the public. *Clinical Thyroidology for Patients*, 6(8). <https://www.thyroid.org/patient-thyroid-information/ct-for-patients/vol-6-issue-8/>
- Armstrong M, Aziz N, & Fingeret A. Physiology, thyroid function. [Updated 2019 Jun 28]. In: StatPearls [Internet]. Treasure Island (FL): Stat Pearls Publishing; 2020 Jan-: <https://www.ncbi.nlm.nih.gov/books/NBK537039/>
- Bragg, S., Ramsetty, A., & Bunt, C. (2020). Refining your approach to hypothyroidism treatment. *Journal of Family Practice*, 2, 84.
- Dunphy, L. M. H. (2015). Primary care: The art and science of advanced practice nursing. primary care: The art and science of advanced practice nursing.
- El Helou, S., Hallit, S., Awada, S., Al-Hajje, A., Rachidi, S., Bawab, W., Salameh, P., & Zein, S. (2019). Adherence to levothyroxine among patients with hypothyroidism in Lebanon. *Eastern Mediterranean Health Journal*, 25(3), 149–159. <https://doi-org.ezproxy.library.und.edu/10.26719/emhj.18.022>
- Halawani, M. S., Nughays, R. O., Altemani, A. F., Hussien, N. M. M., Alghamdi, N. M., Alasadi, F. H. A., Wasfi, L. A., Alrehaili, M. A., Alharbi, A. A., & Siraj, M. M. (2018). Causes, diagnosis, and management of hypothyroidism. *Egyptian Journal of Hospital Medicine*, 71(1), 2250–2252. <https://doi-org.libproxxy.usouthal.edu/10.12816/0045298>
- Hoang, T. D., Olsen, C. H., Mai, V. Q., Clyde, P. W., & Shakir, M. K. M. (2016, May). Desiccated thyroid extract compared with levothyroxine in the treatment of hypothyroidism: a randomized, double-blind, crossover study. <https://www.ncbi.nlm.nih.gov/pubmed/23539727>

- Jacqueline Jonklaas, Eshetu Tefera, & Nawar Shara. (2019). Short-term time trends in prescribing therapy for hypothyroidism: results of a survey of american thyroid association members. *Frontiers in Endocrinology*, 10.  
<https://doi.org/10.3389/fendo.2019.00031>
- McAninch, E. A., & Bianco, A. C. (2019). “The swinging pendulum in treatment for hypothyroidism: From (and Toward?) Combination Therapy.” *Frontiers in Endocrinology* 10 (July). doi:10.3389/fendo.2019.00446.
- McAninch, E. A., & Bianco, A. C. (2016). The history and future of treatment of hypothyroidism. *Annals of internal medicine*, 164(1), 50–56.  
<https://doi.org/10.7326/M15-1799>
- Mooijaart, S. P., Du Puy, R. S., Stott, D. J., Kearney, P. M., Rodondi, N., Westendorp, R. G. J., den Elzen, W. P. J., Postmus, I., Poortvliet, R. K. E., van Heemst, D., van Munster, B. C., Peeters, R. P., Ford, I., Kean, S., Messow, C.-M., Blum, M. R., Collet, T.-H., Watt, T., Dekkers, O. M., & Jukema, J. W. (2019). Association between levothyroxine treatment and thyroid-related symptoms among adults aged 80 years and older with subclinical hypothyroidism. *JAMA: Journal of the American Medical Association*, 322(20), 1977–1986. <https://doi-org.ezproxy.library.und.edu/10.1001/jama.2019.17274>
- Natural vs. Synthetic Thyroid Medications for Thyroid. (2018, January 11).  
[https://www.medicinenet.com/natural\\_vs\\_synthetic\\_thyroid\\_medications/ask.htm](https://www.medicinenet.com/natural_vs_synthetic_thyroid_medications/ask.htm)
- Okuroglu, N., Ozdemir, A., Sertbas, Y., & Sancak, S. (2017). The relationship between thyroid antibody titer and levothyroxine dose in patients with overt primary hypothyroidism. *Annals of Saudi Medicine*, 37(3), 189–193. <https://doi-org.ezproxy.library.und.edu/10.5144/0256-4947.2017.189>

- Shim, J., Lin, T., Dashiell-Earp, C., Nechrebecki, M., & Leung A. M. (2019). Endocrinology practice patterns of hypothyroidism and osteoporosis management in a U.S. tertiary academic medical center. *Clinical Diabetes and Endocrinology*, 5(1), 1–8. <https://doi-org.libproxy.usouthal.edu/10.1186/s40842-019-0085-8>
- Shomon, M. (2019, November 29). Desiccated thyroid extract drugs: Alternatives to synthroid. <https://www.verywellhealth.com/armour-thyroid-for-hypothyroidism-3233291>
- T, I., SB, P., Maciel R, M. de B., & AC, B. (2020). Liothyronine and desiccated thyroid extract in the treatment of hypothyroidism. doi: DOI: 10.1089/thy.2020.0153
- Udovicic, M., Pena, R. H., Patham, B., Tabatabai, L., & Kansara, A. (2017). Hypothyroidism and the Heart. *Methodist DeBakey cardiovascular journal*, 13(2), 55–59. <https://doi.org/10.14797/mdcj-13-2-55>
- Ungvarsky, J. (2019). Levothyroxine. Salem press encyclopedia of health.
- West, V., & Felz, M. W. (2020). Hypothyroidism: A case of fatigue, weight gain, and constipation. *Clinical Advisor*, 27–34.
- What You Need to Know About Hypothyroidism Extract Medications. (n.d.). <https://www.endocrineweb.com/conditions/hypothyroidism/natural-thyid-extract-comeback>

