

**Development of a Liposomal Formulation for the Transdermal Delivery  
of Liothyronine**

(Technical Report)

**The Quest for Better Care for Hypothyroidism Patients**

(STS Research Paper)

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by

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## Preface

How may treatment of hypothyroidism be improved? In hypothyroid patients, production of both thyroxine (T4) and triiodothyronine (T3) are inadequate, but they are prescribed only synthetic LT4. Despite LT4 treatment, many hypothyroid patients still experience persistent symptoms.

Can medically unmet subsets of levothyroxine-treated hypothyroid patients with persistent symptoms be adequately treated with a consistent, slow-release, and nontoxic liothyronine monotherapy drug delivery system? In principle, supplemental liothyronine (LT3) should help hypothyroid patients who do not respond to LT4 monotherapies. Because of its short half-life, however, oral LT3 can cause transient peaks and thyrotoxicity. Therefore, a novel gel formulation of LT3 encapsulated into liposome vehicles was developed for a rate-controlled transdermal patch. Through *in-vitro* permeation tests, the LT3 liposomal transdermal formulation was found to have the ability to permeate the skin for a period of 24 hours.

How are patients, caregivers, medical associations, advocacies, and others striving to promote the wellbeing of hypothyroid patients? Many patients on thyroxine replacement, even in cases of normal TSH, report poor personal wellbeing. Patients and caregivers who recognize that personal wellbeing is not entirely dependent upon the physiological condition and who practice patient-specific wellbeing care can sometimes make life with hypothyroidism more bearable than a conventional medical assessment alone would suggest. Exercise, nutrition, and gamification of behavioral change models can improve patient wellbeing. Medical professionals can learn from patients, untrained caregivers, and patient advocates about how best to care for hypothyroidism patients who do not respond well to conventional medical treatments.