

Regulation of thyroid Hormone Release

Thyroid-Stimulating Hormone—Primary Controller of Thyroid Hormone Secretion

To maintain normal levels of metabolic activity in the body, the free plasma levels of thyroid hormone must be regulated. Thyroid hormone secretion is primarily regulated by thyroid-stimulating hormone (thyrotropin, TSH). TSH secretion from the pituitary gland is increased by the hypophysiotropic hormone thyrotropin-releasing hormone (TRH) and is inhibited in a negative feedback fashion by circulating T4 and T3. Although some feedback occurs at the hypothalamus by influencing TRH secretion, the predominant feedback occurs at the level of the pituitary. Because T4 is deiodinated to T3 in the pituitary gland, T3 appears to be the final effector that mediates the negative feedback. TSH Promotes the Synthesis and Secretion of Thyroid Hormones. Binding of TSH to its receptors on the cell membrane of the thyroid gland activates adenylyl cyclase so that cyclic AMP mediates at least some of the actions of TSH. An immediate effect of TSH is to promote endocytosis of colloid, proteolysis of thyroglobulin, and release of T4 and T3 into the circulation. In addition, TSH stimulates steps in the synthesis of thyroid hormones, including iodine trapping, iodination, and coupling to form thyroid hormones. TSH Has Chronic Effects to Promote Growth of the Thyroid Gland. The chronic effects of TSH include increased blood flow to the thyroid gland and induction of hypertrophy and hyperplasia of the follicular cells.

With prolonged TSH stimulation, the thyroid enlarges, and a goiter occurs. In the absence of TSH, there is marked atrophy of the gland.