THYROID HORMONE DYSGENESIS I

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- thyroid hormones (T₄, T₃) are made by the follicular cells of the thyroid gland (Figure 1)
- production of thyroid hormones is signaled by thyroid stimulating hormone (TSH) from the anterior pituitary (Figure 2)
- the inability to transport iodide into the thyroid gland results in a lack of formation of thyroid hormones as their synthesis depends on iodine (Figure 1).
- lack of thyroid hormone in the blood causes the brain to send out unabated signals for the gland to make more thyroid hormone, which of course is not possible (Figure 2)
- thyroid hormone functions:
  - growth
  - maintaining body’s basal metabolic rate (BMR)
  - heat production
  - promoting sweating
- consequences of hypothyroidism (low blood thyroid concentration)
  - low BMR → weight gain
  - sluggishness, decreased heart rate
  - intolerance to cold
  - dry skin
**Figure 1.** Iodine from the blood is taken into the follicular cell by an iodide transport protein. Iodine is then attached to tyrosine (T) on thyroglobulin (Tgb) in the colloid. Thyroid hormones (T₄, T₃) form on the iodinated Tgb, then are released from Tgb in the cell, and then move to the blood. In thyroid hormone dysgenesis, the iodide transport protein is lacking (X). Without uptake of iodide the follicular cell cannot produce thyroid hormone. Patients require hormone replacement therapy.

**Figure 2.** TRH from hypothalamus region of the brain signals anterior pituitary to release TSH. TSH signals thyroid gland to make and release thyroid hormones. Abundant thyroid hormone signals the hypothalamus and anterior pituitary to stop releasing their stimulatory factors. In thyroid hormone dysgenesis, the lack of thyroid hormones causes the stimulatory factors to be overproduced due to loss of inhibitory signals (X) and leads to growth (enlargement) of the thyroid gland.