

- **1. Thyroglobulin synthesis**
- **2. Active uptake of iodides** from the plasma and its concentration in the thyroid colloid (*the iodide pump*).
- **3. Oxidation of iodide** into elemental iodine.
- **4. Iodination of tyrosine** molecules of the thyroglobulin by iodine  $\longrightarrow$  formation of monoiodotyrosine (MIT) and diiodotyrosine (DIT)
- **5. Condensation** of two molecules of DIT to form  $T_4$ , or one molecule of DIT and one molecule of MIT to form  $T_3$ .

# Transport of thyroid hormones

- The normal level of total  $T_4$  in plasma is  $8\mu\text{g/dL}$ , for  $T_3$  it is  $0.15\mu\text{g/dL}$ .
- Only 0.02% of  $T_4$  and 0.2% of  $T_3$  are free, the remaining portions are bound to plasma albumin, thyroid-binding prealbumin (TBPA) and thyroid-binding globulin (TBG).
- Most of the circulating  $T_3$  is derived from deiodination of  $T_4$  by target tissues.
- Thyroid-binding proteins increase during pregnancy, by estrogens, or tranquilizers (e.g. benzodiazepines).
- They are decrease by glucocorticoids and androgens.

- **5. Synergism with catecholamines:**
- Thyroid hormones increase the number and sensitivity of  $\beta$ -adrenergic receptors.
- Some of the manifestations of hyperthyroidism (e.g. tachycardia, extrasystoles, sweating and tremors) can be abolished by  $\beta$ -adrenergic blockers.

- There are circadian and circannual rhythms of thyroid hormones secretion; their level is slightly higher in the morning and in winter.
- Cold stimulates the release of the hypothalamic TRH → release of pituitary TSH → secretion of thyroid hormones, but the exposure to cold should be maintained for at least 4 - 5 weeks.

# Control of thyroid activity during pregnancy

- During pregnancy, the placenta secretes two hormones which stimulate thyroid activity.
- These hormones are the human chorionic gonadotropin (hCG) and the human chorionic thyrotropin (hCT).
- Both hormones are found throughout pregnancy, but the hCG is found in particularly large amounts during the first trimester.
- These two hormones take over the control of thyroid activity during pregnancy and TSH secretion is markedly suppressed.

- Cutaneous vasodilatation makes the skin red and warm, and excessive sweating makes it moist.
- The heart rate and cardiac output increase which increase the systolic blood pressure.
- Peripheral vasodilatation decreases the diastolic pressure, so the pulse pressure increases.

- Hyperthyroidism is treated by antithyroid drugs or by surgical removal of the excess thyroid tissue (thyroidectomy).
- Graves' disease and exophthalmos respond well to immunosuppressive drugs, e.g. glucocorticoids

- **3. Basal metabolic rate (BMR):**
- It increased in hyperthyroidism and decreased in hypothyroidism.
- It is nonspecific test but generally an easy useful indicator.
- **4. Serum cholesterol:**
- It is high in hypothyroidism and low in hyperthyroidism.
- This is also a nonspecific test.

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