Thyroid gland disorders

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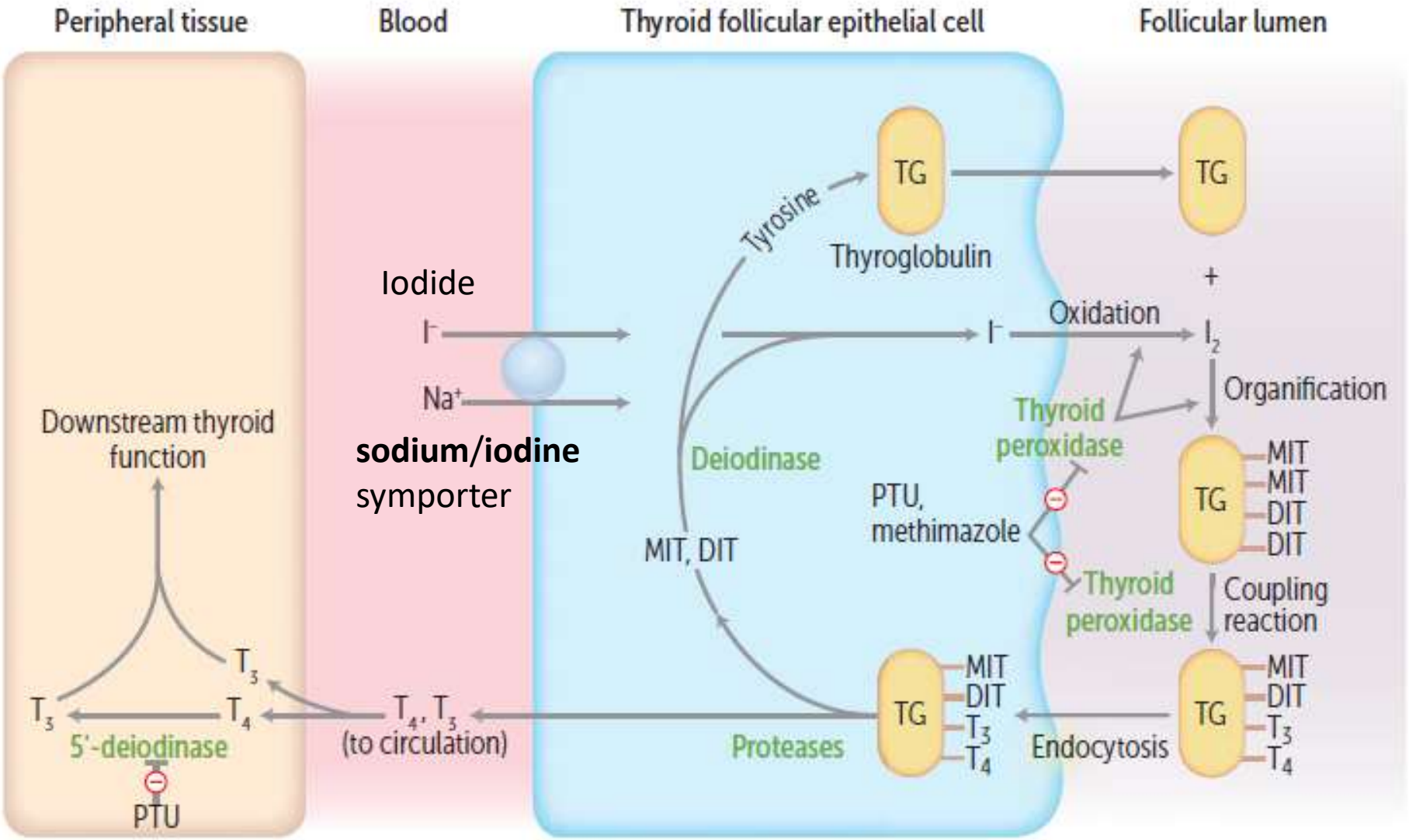
Thyroid gland disorders

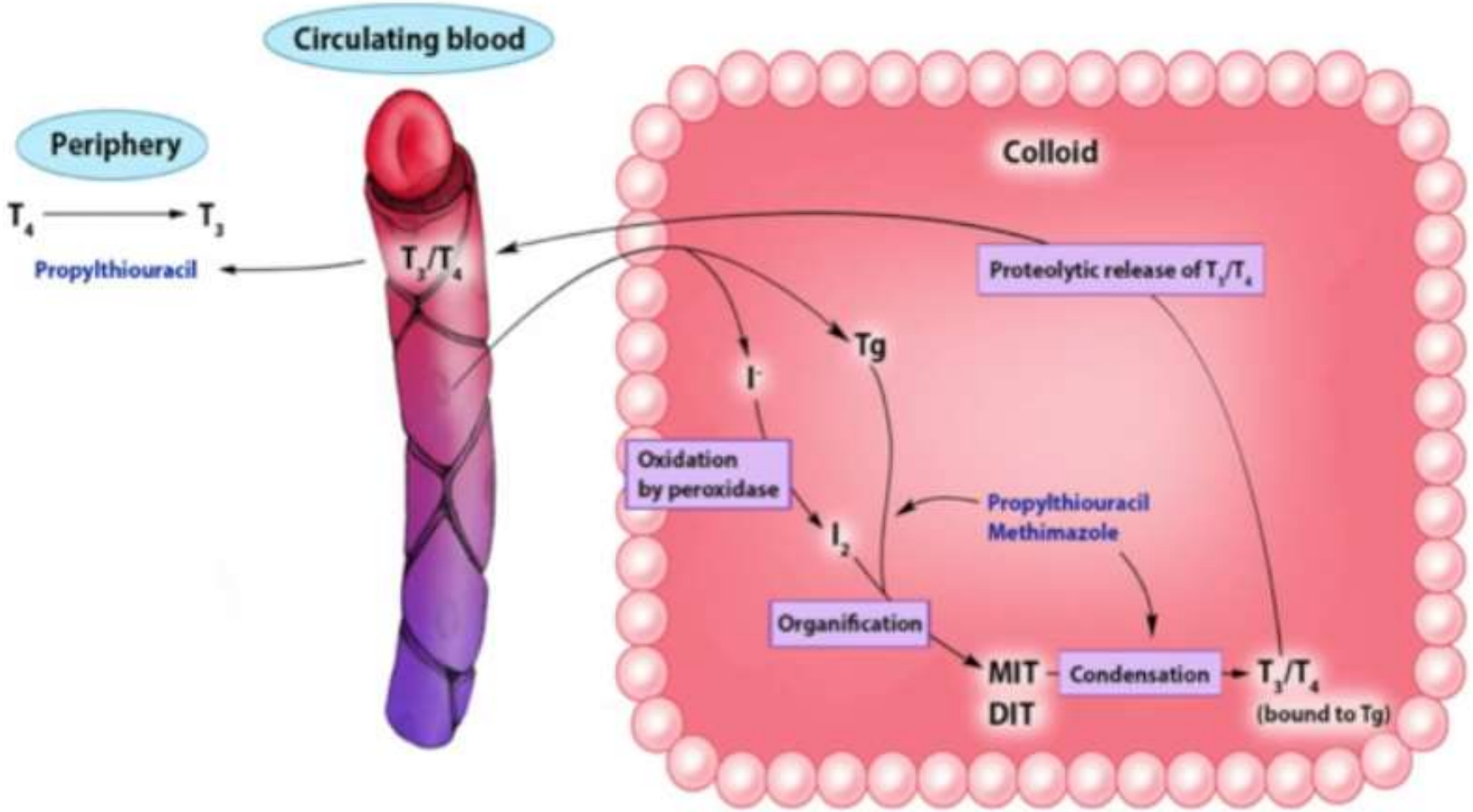
- Thyroid hormone induces lots of function in our body.
- Maturation of CNS in early growth
  - – baby affected –
    - low IQ & lots of other problems
- Work through out our lifespan to increase BMR, ↑CO, ↑/promote bone growth

- Most of T4 & T3 in blood is bound to TBG
- Only free hormone is actually active

↓ TBG ---------- Hepatic failure	Total T4/T3 ↓ Free T4/T3 - unchanged
↑ TBG ---------- Pregnancy OCP use	Total T4/T3 ↑ Free T4/T3 - unchanged

Thyroid hormone synthesis




Circulating blood
Periphery
T_4 → T_3
Propylthiouracil
T_3/T_4
Colloid
Proteolytic release of T_3/T_4
Tg
I^-
Oxidation by peroxidase
I_2
Propylthiouracil
Methimazole
Organification
MIT
DIT
Condensation
T_3/T_4
(bound to Tg)

Hyperthyroidism

- Excess production of thyroid hormones
- MCC is Graves disease

Hyperthyroidism

- Weight loss
- ↑ Appetite
- Heat intolerance
- Anxiety
- Diaphoresis
- Palpitations
- ↑ Bowel frequency
- Tremor
- Tachycardia
- ↑ Pulse pressure
- Warm skin
- Hyperreflexia
- Atrial fibrillation

Hyperthyroidism

- ↓ **TSH**
- ↑Total T4
- ↑ Free T4
- ↑ Total T3
- ↑ Free T3

Hyperthyroidism

Graves disease

- Pathology
  - Autoimmune TSI antibodies bind to TSH receptors and stimulate thyroid hormone production

Hyperthyroidism-Graves disease

Pathophysiology

- Graves disease results from the production of thyroid-stimulating immunoglobulins (TSI) by stimulated B lymphocytes.
- These immunoglobulins bind to the thyroid-stimulating hormone (TSH) receptor to mimic the action of TSH ,resulting in follicular cell growth, an increase in vascularity and the excessive synthesis and secretion of thyroid hormone.

Hyperthyroidism

- Graves disease

→Characteristics

- Exophthalmos

Hyperthyroidism

- Graves disease

→Characteristics

- **Exophthalmos**
- **Pretibial myxedema**
- **Painless diffuse goiter**
- TSI antibodies in serum
- High uptake on thyroid scan

Hyperthyroidism

- Graves disease- **Treatment**
- Thioamides
  - Methimazole
  - Propylthiouracil(PTU)

Hyperthyroidism

- Graves disease- **Treatment**
- Thioamides
  - Methimazole
  - Propylthiouracil(PTU)
  - Radio ablation with radioactive iodine
  - Subtotal thyroidectomy
  - After treatment patient may need thyroid hormone replacement as it fall to very low level
  - Beta-blockers

Hyperthyroidism

Toxic adenoma

Toxic adenoma/toxic multinodular goiter

- Pathology
  - Hyperactive nodules produce excess thyroid hormone
- Aids in diagnosis
  - Thyroid scan – increased uptake
- Treatment
  - Thionamides
  - Radioactive iodine or resection

Hyperthyroidism

Subacute thyroiditis

Subacute thyroiditis

Subacute (de Quervain's) thyroiditis

- Pathology
  - Enlarged, inflamed thyroid due to a virus stimulus

Subacute thyroiditis

- Characteristics
  - **Painful** goiter
  - Symptoms of hyperthyroidism
  - Neck pain
  - Fever
  - ↑ ESR
  - ↓ uptake on thyroid scan
  - Self-limited

Subacute thyroiditis

- Treatment
  - NSAIDS
  - Beta-blockers

Thyroid storm

- *Very severe* ***hyper-***thyroidism-due to infection, surgery, stressful event *in a patient already has hyperthyroidism*
- Symptoms are like hyperthyroidism but more severe
  - Tachycardia
  - Diaphoresis
  - Fever
  - Mental status changes

  Labs

  Low TSH

  High free T4 & high T3

Thyroid storm

- *Treatment*
  - **Beta-blockers**
    - **Beta**-blockade is mainstay of *symptomatic* therapy; antiadrenergic **effects** block **effects** of excess **thyroid** hormone. **Beta**-blockade also plays a **role** in the prevention of peripheral conversion of T4 to T3. **Propranolol** is the best studied in this class, but other **beta**-**blockers** have similar **effects in hyperthyroidism**.
  - **Thionamides**
    - **Intravenous Propylthiouracil** inhibits the production of new thyroid hormone in the thyroid gland.
    - It acts by inhibiting the enzyme thyroid peroxidase, which usually functions to convert iodide to iodine molecule and incorporate the iodine molecule into amino acid tyrosine.

Thyroid storm

- IV sodium iodide
  - The major actions of **iodide** on **thyroid function** are inhibition of **thyroid** hormone release from the **thyroid** gland and a transient decrease in **thyroid** hormone synthesis (the acute Wolff-Chaikoff effect) . **Iodide** causes a transient decrease in **thyroid** hormone synthesis.
- **Glucocorticoids**
  - **Glucocorticoids** may also affect **thyroid** function.
  - In high doses, **glucocorticoids** reduce the conversion of active thyroxine (T4) to the more active triiodothyronine (T3).
  - Hence, in patients with severe **hyperthyroidism**, **glucocorticoids** may be used to reduce the levels of circulating **thyroid** hormones.

Hypothyroidism

Hypothyroidism

- **Causes**
  - **Autoimmune destruction**
  - Thyroid surgery
  - Thyroid radio-ablation
  - Pituitary dysfunction
  - Chronic lithium use
  - Chronic iodide use

Hypothyroidism

- **Clinical features**
  - Weakness
  - Fatigue
  - ↓Exercise capacity
  - Cold intolerance
  - Weight gain
  - Constipation
  - Irregular menstruation

Hypothyroidism

- **Clinical features**
  - Depression
  - Hoarseness
  - Hypo-reflexia
  - Bradycardia
  - Dry Skin
  - Edema

Hypothyroidism

- **Labs**
  - **↑ TSH**
  - ↓ Free T4 & T3

Hypothyroidism

- **Hashimoto Thyroiditis**
  - **MCC of thyroiditis**
  - **Autoimmune- chronic thyroiditis –** chronic Inflammation of thyroid gland
  - Thyroid gland is attacked by both cell mediated and antibody mediated immune process
  - Middle-aged women
  - Typical hypothyroidism symptoms
  - Painless goiter
  - Vs. Subacute thyroiditis(deQ)-Painful

Hypothyroidism-Hashimoto Thyroiditis

- **Labs**
  - ↑ TSH
  - ↓ Free T4 & T3
  - *Anti-thyroid peroxidase antibodies*
  - *Anti-thyroglobulin antibodies*
  - Like graves disease AB - these ABs not stimulate thyroid gland but create inflammation & gradual destruction of thyroid follicles.

Hypothyroidism-Hashimoto Thyroiditis

- **Labs**
- Biopsy
  - Lymphocytic infiltrates and fibrosis
- Radiology
  - ↓ uptake on thyroid scan
- ***Treatment***
  - Thyroid hormone replacement

Cretinism

- Congenital hypothyroidism
  - caused by severe iodine deficiency or
  - hereditary disorder of thyroid hormone synthesis
- Hypothyroidism lead to
  - abnormal mental development and
  - growth retardation

Cretinism

- **Clinical features**
  - Poor feeding and lethargy
  - Large fontanelles that remain open
  - Thick tongue
  - Constipation
  - Umbilical hernia
  - Poor growth
  - Hypo-tonicity
  - Dry skin
  - Hypothermia
  - Jaundice

Cretinism

- **Labs**
  - ↑ TSH
  - ↓ T4

- *Radiology*
  - Poor bone development
- *Thyroid scan*
  - ↓ uptake

Cretinism

- Treatment
  - Thyroid hormone replacement
  - Start early on soon after birth to prevent CNS problem and bone growth retardation

Hypothyroidism

Myxedema Coma

- untreated long-standing disease
- stupor
- hypothermia
- precipitated:
  - infection
  - cold-exposure
- Tx
  - high doses T4, T3
  - corticosteroids
  - warming blankets
  - IVF