MAKEUP: Thyroid Hormone Synthesis

General: Thyroid hormones (T₄ & T₃) have effects on all cells
- ↑cellular transcription →↑cellular activity →↑BMR

Synthesis

Iodine: Dietary iodine 500μg /day (min requirement 120-150μg/day)
- Converted to iodide for absorption

I- actively transported into follicular cells in thyroid gland
- Called iodine trapping
- Concentrates I- to 30 x blood conc.

**iodide pump activity ↑with TSH, ↓with perchlorate/SCN⁻ ions**

I- oxidised to iodine in cell
- Catalysed by thyroid peroxidase
  **↑activity with TSH**

Iodine rapidly binds 3 position of tyrosine in thyroglobulin molecule
- Catalysed by iodonase
  **↑activity with TSH**
- Forms mono-iodotyrosine then di-iodotyrosine

Mono-iodotyrosine + Di-iodotyrosine = Tri-iodothyronine (T₃)
- Catalysed by peroxidase
  **↑activity with TSH**
- 7% of thyroid hormone produced
- 4-5 x more active than T₄
- >99% protein bound
- Binds 1° albumin and thyroxine binding pre-albumin (TBPA)
- t½: 24 hrs

Di-iodotyrosine + Di-iodotyrosine = Thyroxine (T₄)
- Catalysed by peroxidase
  **↑activity with TSH**
- 93% of thyroid hormone produced
- Less active than T₃ → thyroidine is de-iodinated to T₃ for activity
- >99% protein bound
- Binds thyroxine binding globulin (TBG) and TBPA
- t½: 7 days

Thyroid hormones formed within thyroglobulin (70 tyrosine residues)
- Synthesised in Golgi apparatus

Thyroglobulin stored in follicular colloid
- Vesicular lysosomal activity breaks down thyroglobulin to release T₃ and T₄, which diffuse out of follicular cell and into circulation via surrounding capillaries
  **↑activity with TSH**

Metabolism of Thyroid Hormones

T₄ de-iodinated to T₃ / rT₃ (inactive compound) 1:1
Both de-iodinated in liver, kidney, skeletal muscle, other tissues to inactive compounds

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Negative Feedback Role

Hypothalamus → Ant. Pituitary → Thyroid → Target Cells

- TRH
- TSH
- T3/T4

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