

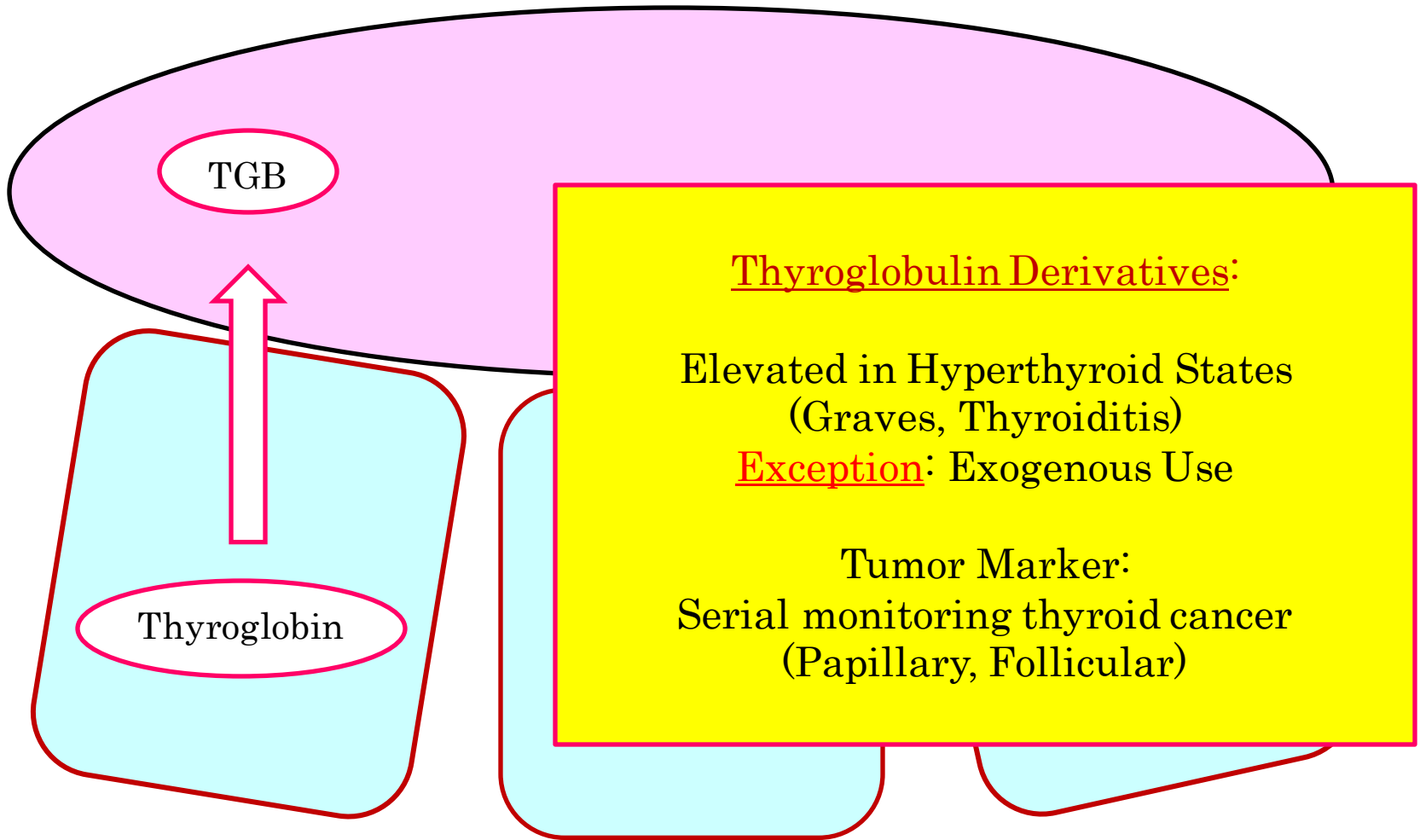
Thyroid Hormone Synthesis, Regulation and Diagnostics



Key Derivatives

12 Days in March

Howard J. Sachs, MD



Thyroglobulin Derivatives:

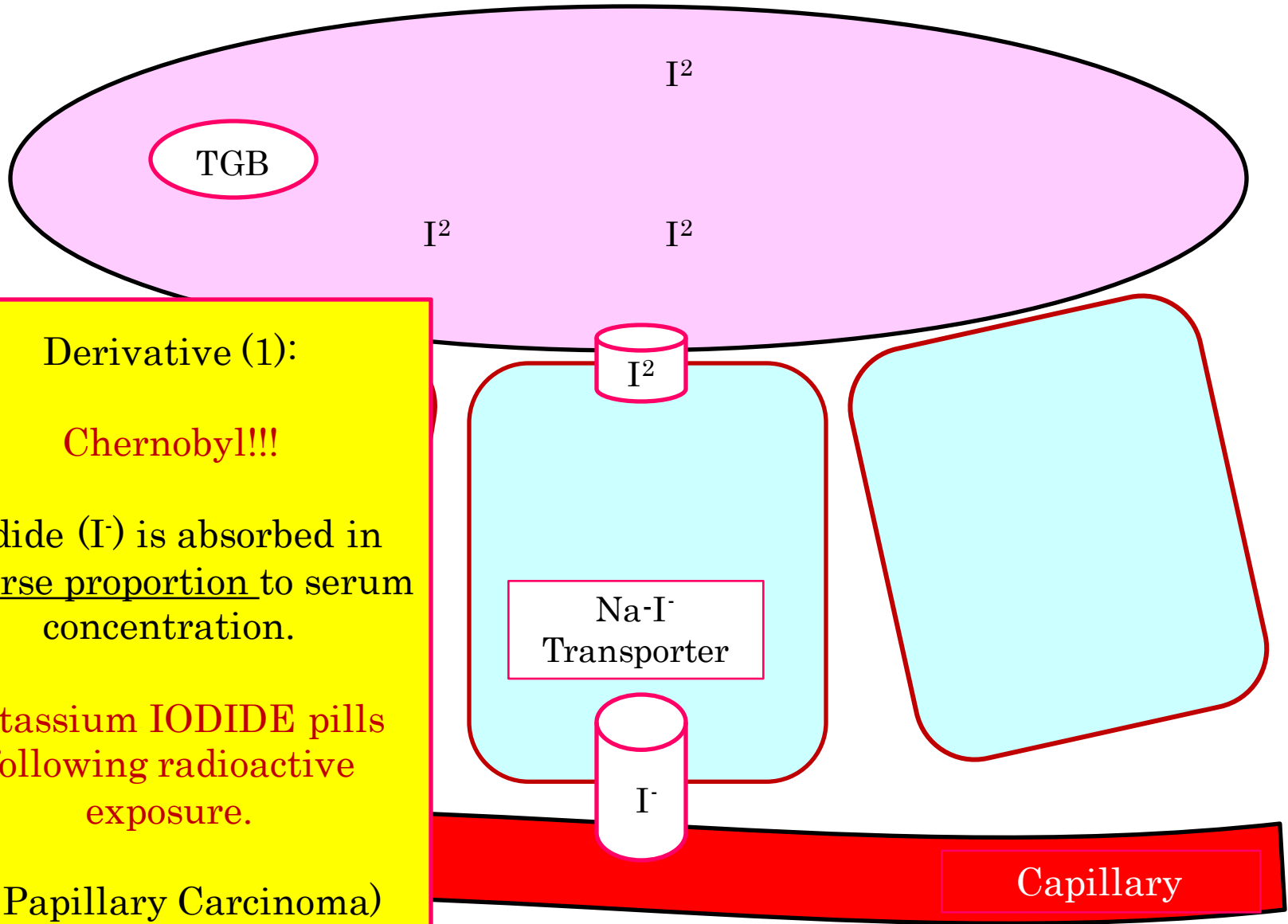
Elevated in Hyperthyroid States
(Graves, Thyroiditis)

Exception: Exogenous Use

Tumor Marker:

Serial monitoring thyroid cancer
(Papillary, Follicular)

Oxidation ($I^- \rightarrow I^2$)



Derivative (1):

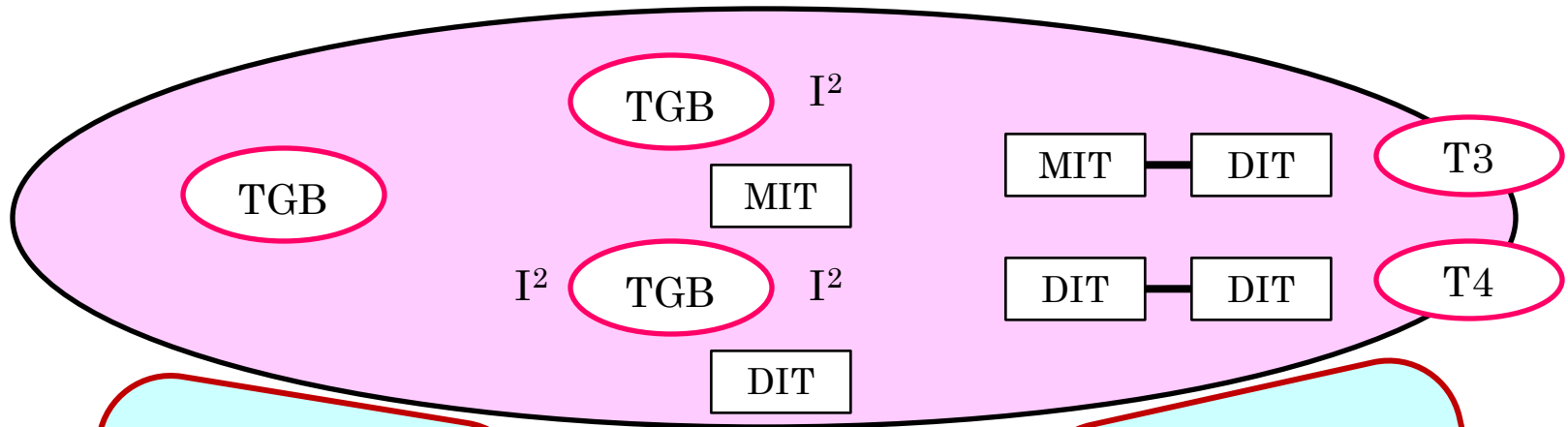
Chernobyl!!!

Iodide (I^-) is absorbed in inverse proportion to serum concentration.

Potassium IODIDE pills following radioactive exposure.

(↓ Papillary Carcinoma)

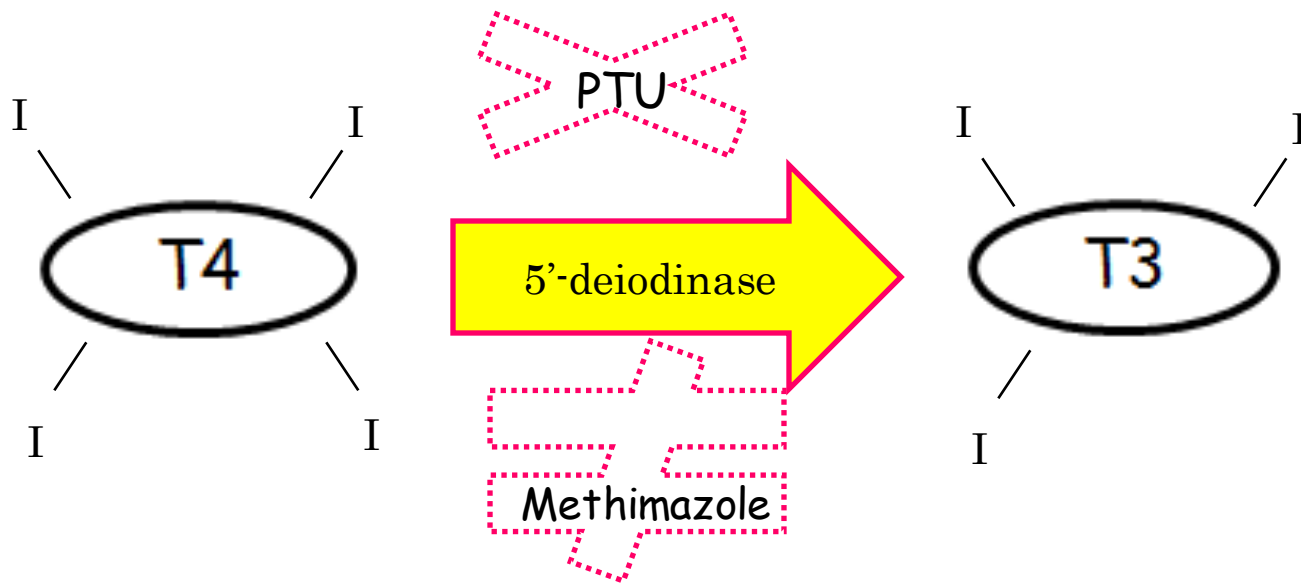
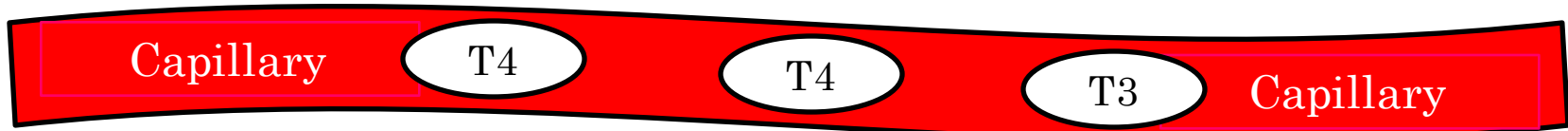
Oxidation ($I^- \rightarrow I^2$), Organification and Coupling



All Three Steps Catalyzed by ~ Thyroid Peroxidase ~

Derivative 1: Pharmacology

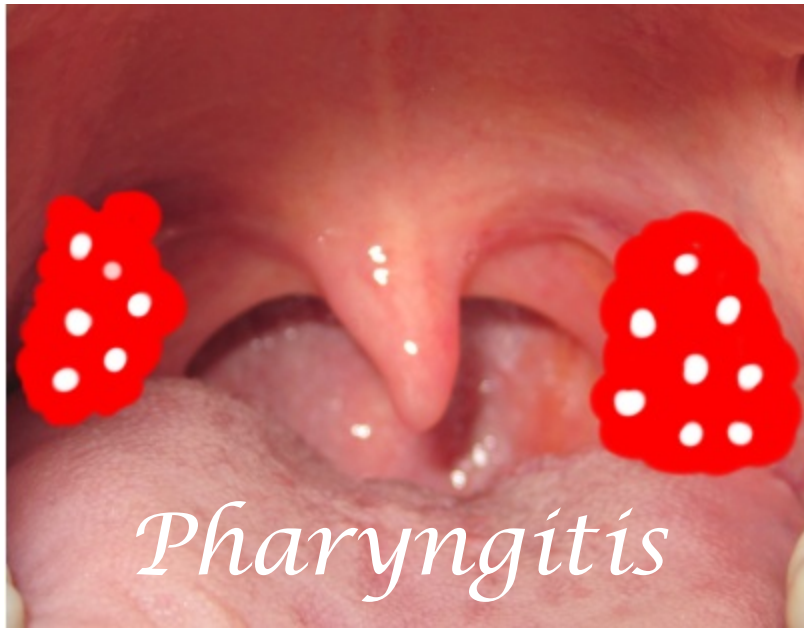
MOA: Thionamides (PTU, Methimazole) inhibit Thyroid Peroxidase.



Derivative 2: Pharmacology

PTU *inhibits* 5'-deiodinase; Methimazole does NOT.

Patients treated with *Methimazole* will also receive β -blockers (which DO inhibit this step)



Derivative 3a, PTU: AE

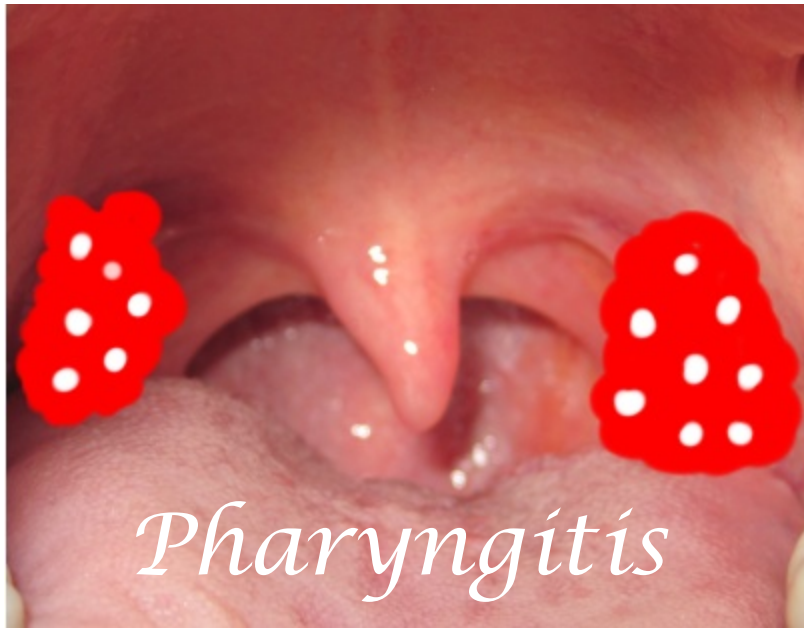
Hepatotoxic
Agranulocytosis

Rx?:

1. Antibiotics
2. Stop PTU
3. G-CSF

Derivative 3b, Methimazole: AE

Pregnancy Contraindication



Derivative 3a, PTU: AE

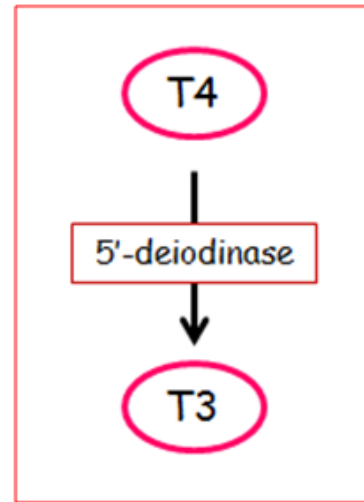
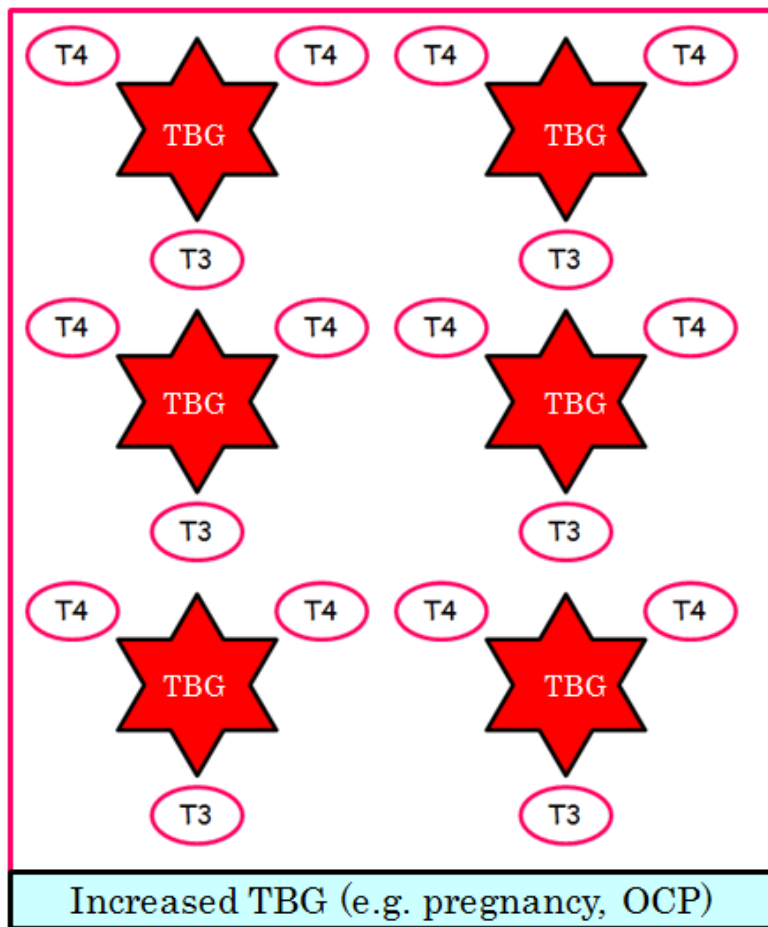
Hepatotoxic
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Rx?:

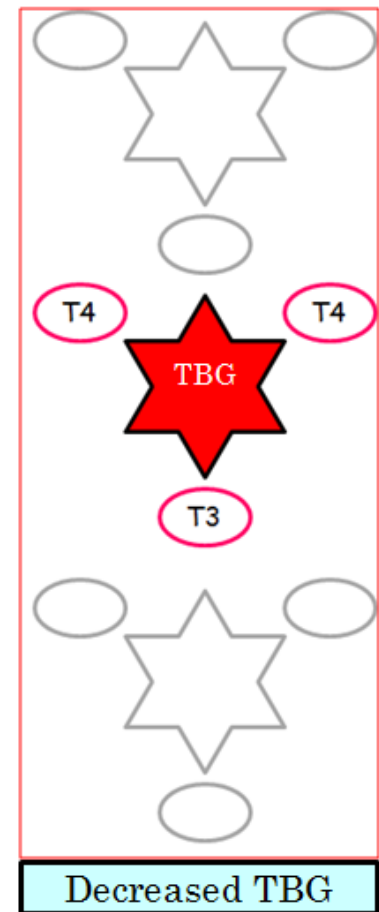
1. Antibiotics
2. Stop PTU
3. G-CSF

Derivative 3b, Methimazole: AE

Pregnancy Contraindication



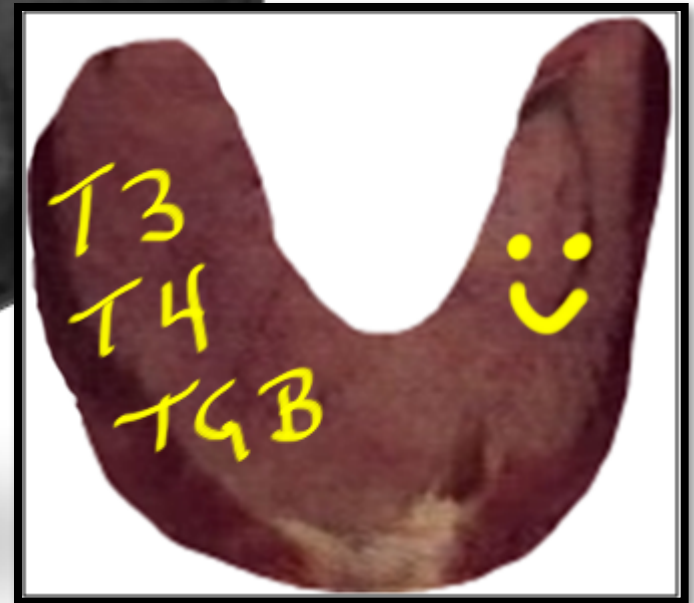
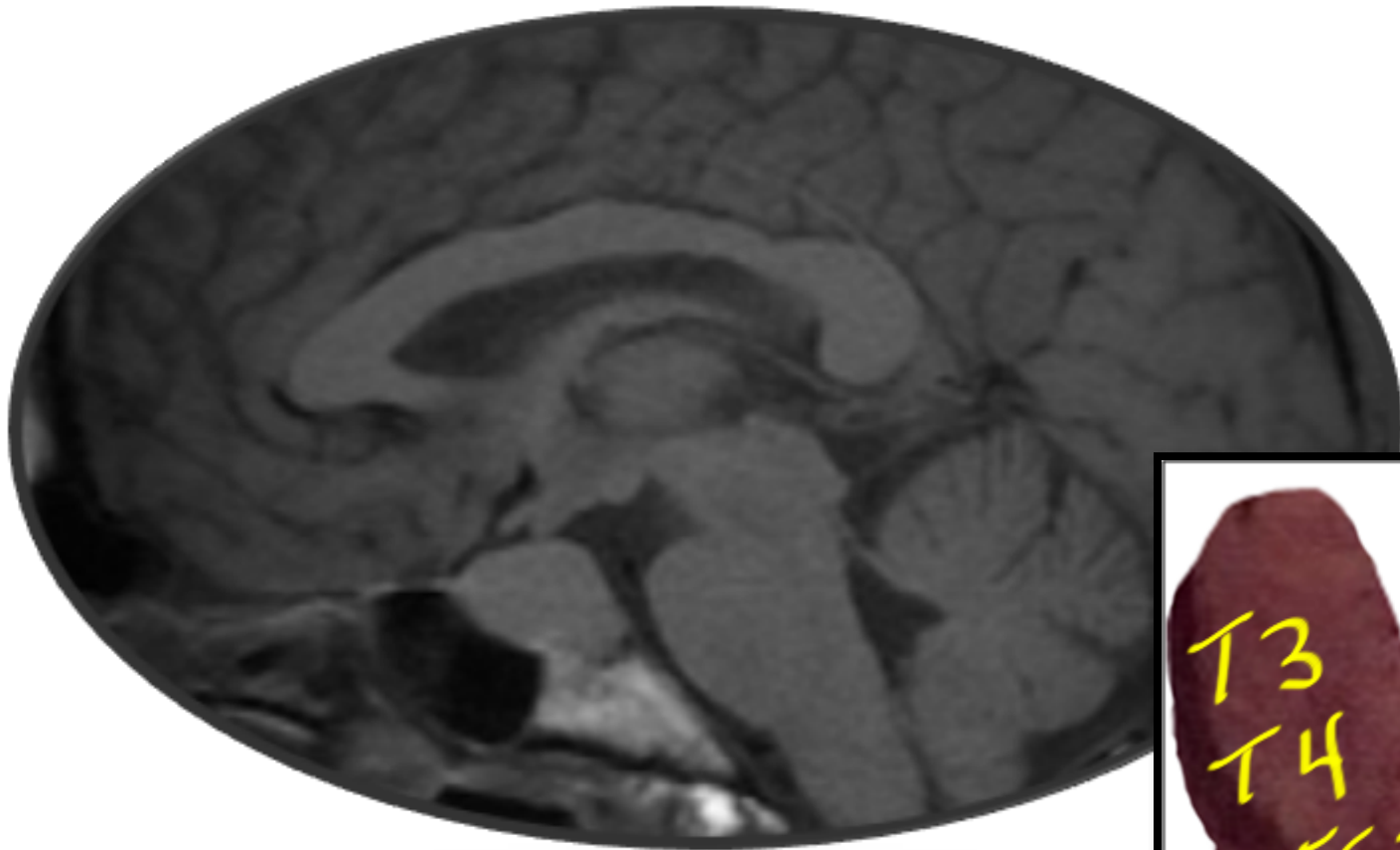
- Free Hormone
- Bioavailable Form

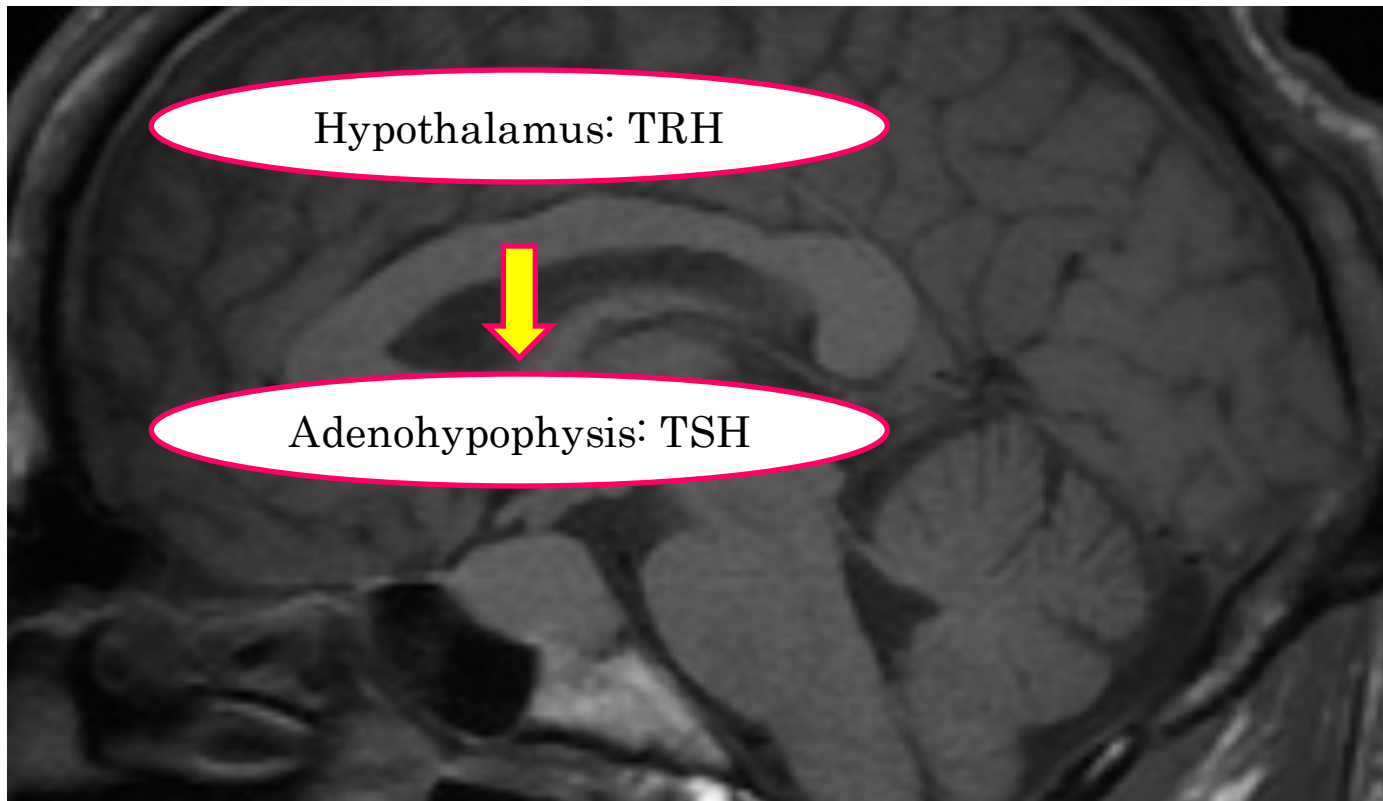


Derivative:

- The increase (or decrease) in TBG is expressed by **total T4 (tT4)**.
- Key clue to a 'TBG' question will be **TSH**.
- Do NOT get caught up in clinical description. Pay attention to the data.

Thyroid Hormone Regulation



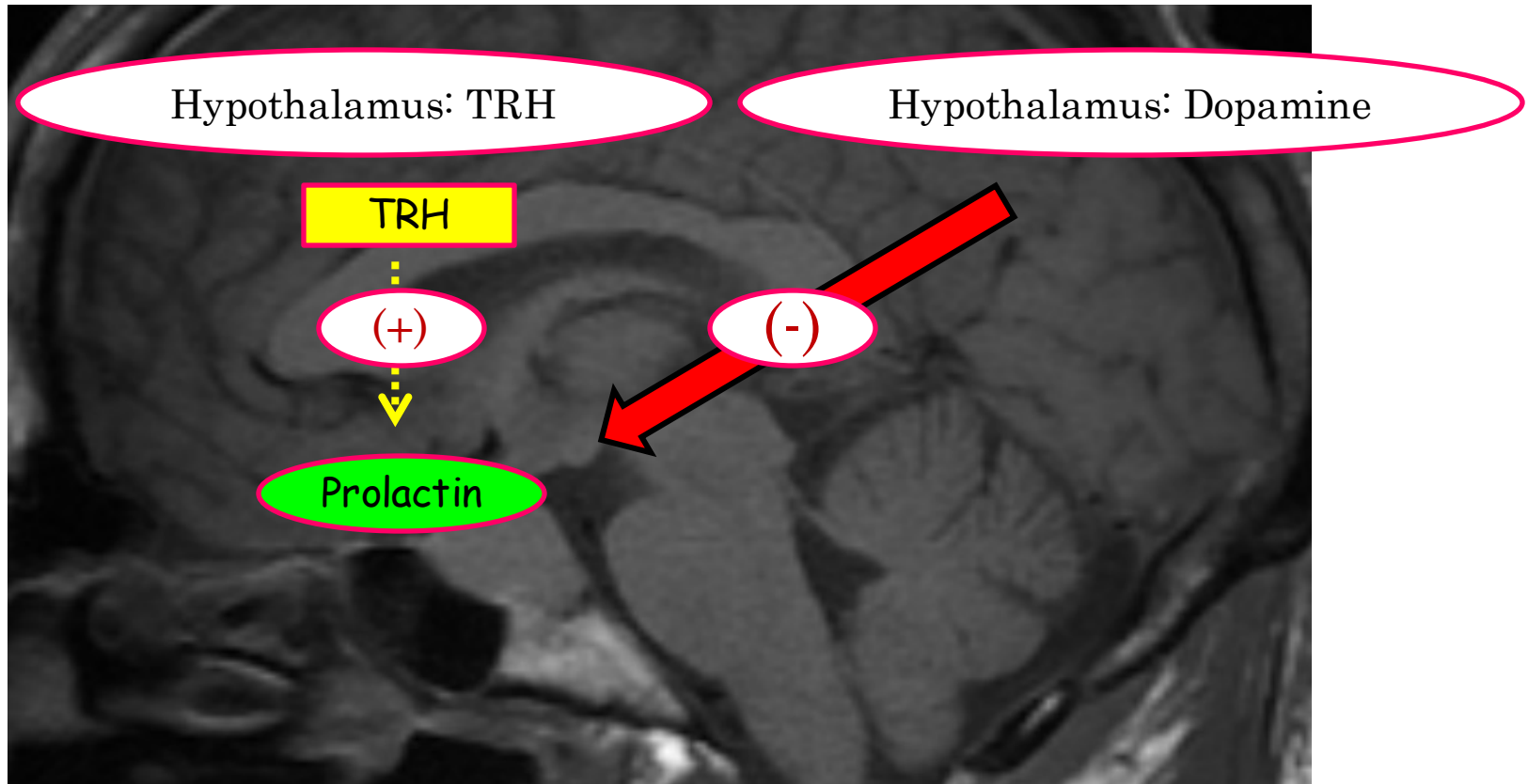


Non-Derivatives (2):

No 1° Hypothalamic Disorders

Only TRH related question focus on hypopituitarism
(i.e. no response to TRH stimulation – Sheehan’s is classic).

TSH secreting adenomas are extremely rare - not really tested.
Combination of low TSH and low T4 suggests pituitary failure.



Non-Derivatives: Loose Associations (1)

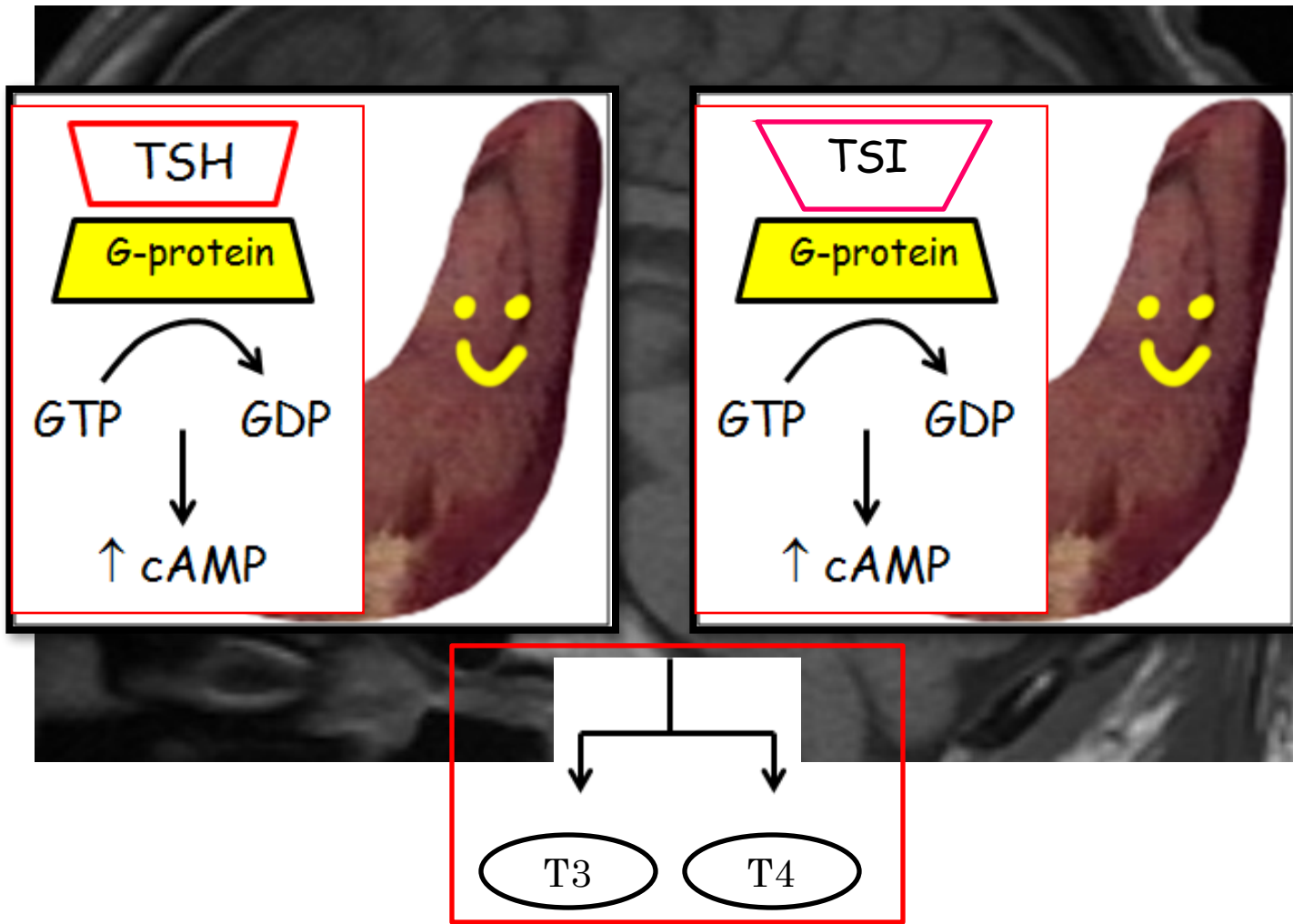
TRH stimulates Prolactin BUT dopamine tonically suppresses release (anti-dopaminergic agents are associated with hyperprolactinemia).

Adenohypophysis: TSH



Non-Derivatives: Loose Associations (2)

TSH and hCG have significant homology.
hCG can actually cause hyperthyroidism during first trimester.



Derivative, Graves:

Thyroid Stimulating Immunoglobulin behaves EXACTLY like TSH (directly stimulates the receptor)

Thyroid Diagnostics

Serology

TSH

Hormone
Total T4 (tT4)
Free T4
T3
rT3

Immune Markers
TSIg

Anti-TPO
Anti-TGB

Miscellaneous:
ESR
TGB

Imaging

Ultrasound

Nuclear
Radioactive Iodide
Uptake (RAIU)

Technetium

Anatomic

Functional

Pathology

FNA: Cytopathology

(Excisional) Biopsy

Thyroid Hormone Synthesis and Regulation and Diagnostics



Key Derivatives

Thyroid Disorders



Hypothyroidism

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www.12daysinmarch.com