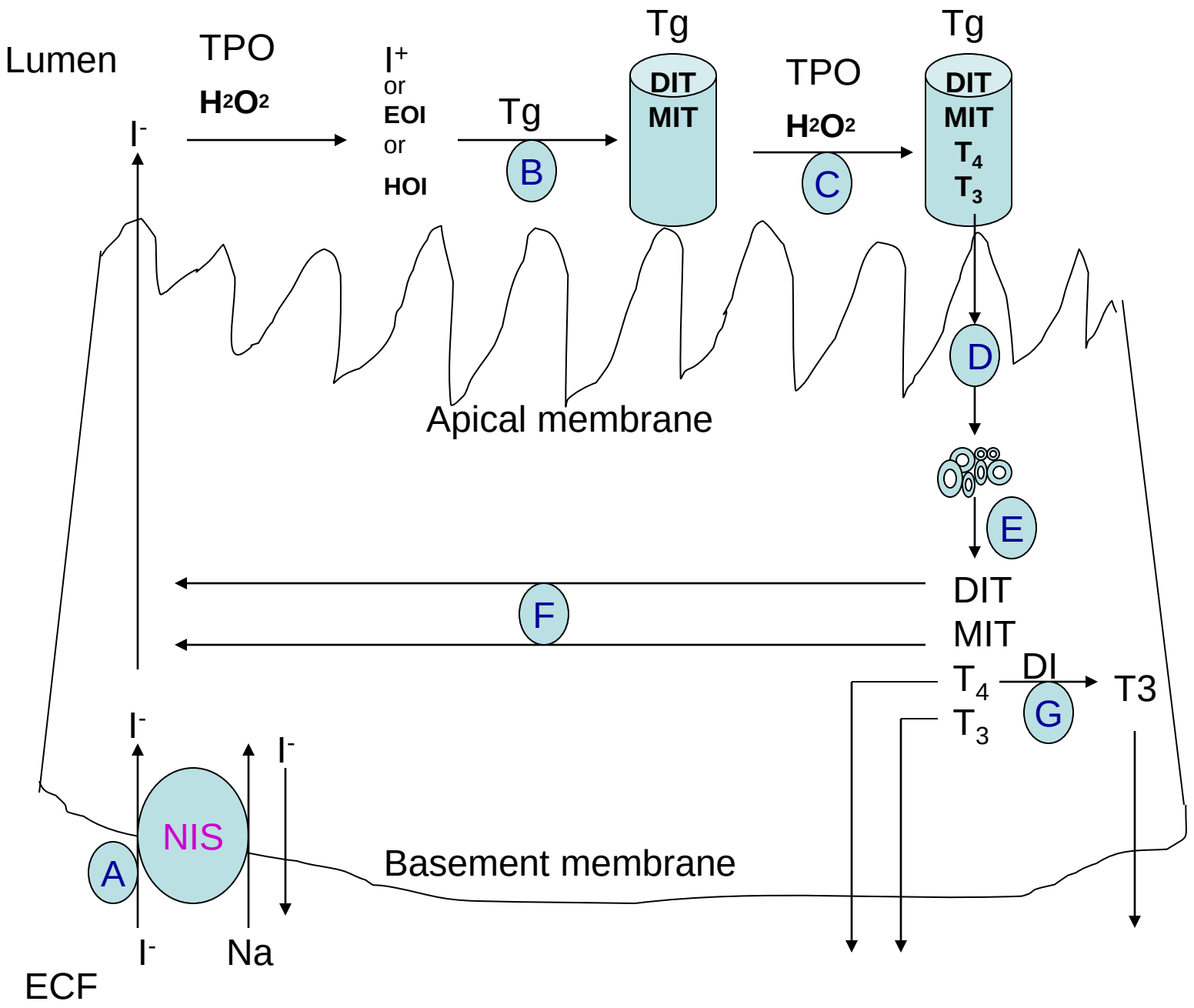
Thyroid hormones & Thyroid inhibitors

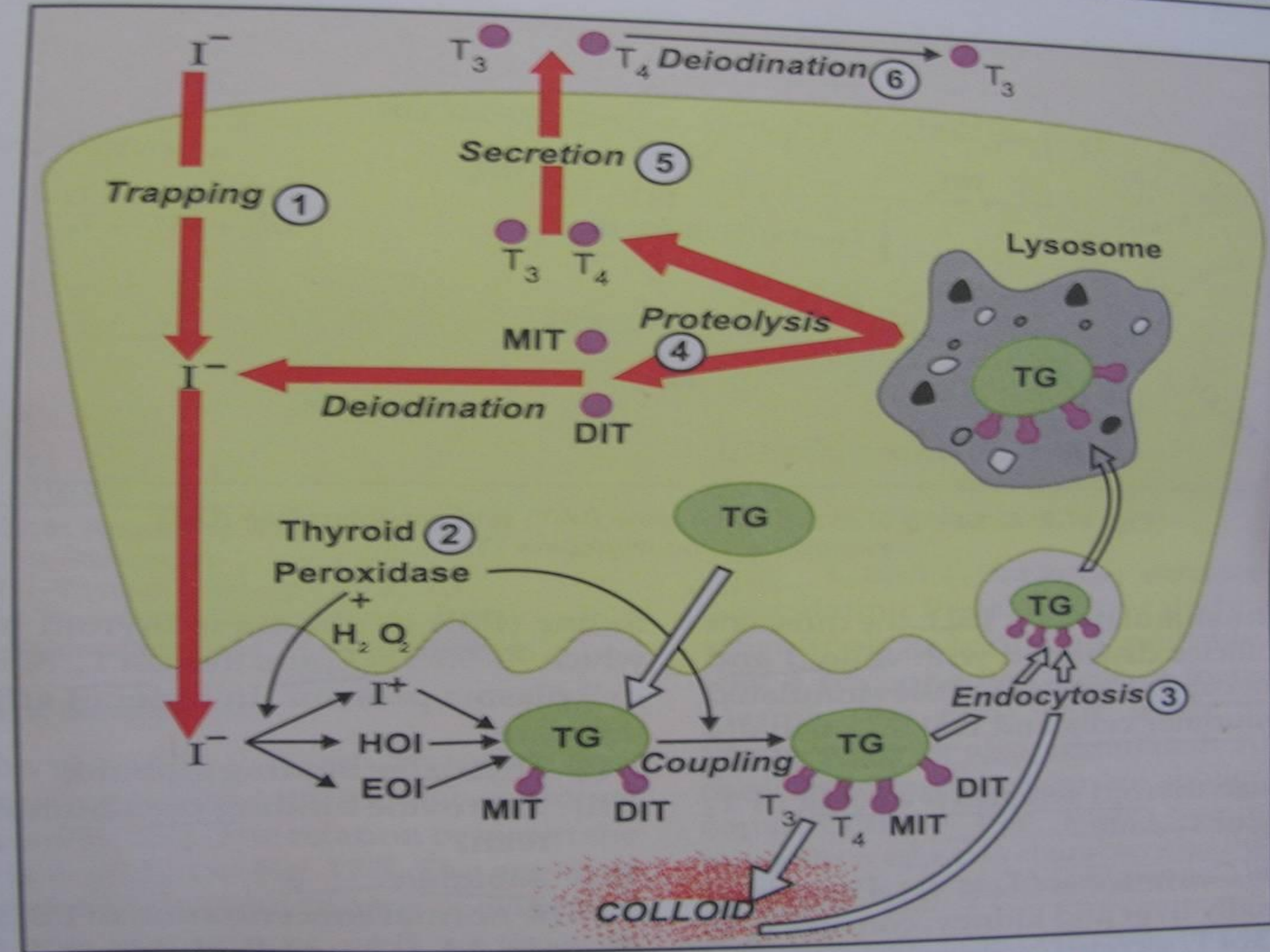
Thyroid hormones

- T3 & T4
- Calcitonin + parathormone – CA metabolism

Thyroid hormones

- Chemistry & synthesis
- Transport, metabolism & excretion
- Regulation of secretion
- Actions
- l- thyroxine
- Uses


Lumen
TPO
H2O2
I-
I+
or
EOI
or
HOI
Tg
B
Tg
DIT
MIT
TPO
H2O2
C
Tg
DIT
MIT
T4
T3
D
Apical membrane
E
F
DIT
MIT
T4
T3
DI
G
T3
I-
I-
NIS
A
Basement membrane
I-
Na
ECF


I⁻
T3
T4
Deiodination 6
T3
Secretion 5
Trapping 1
T3
T4
Lysosome
Proteolysis
4
MIT
I⁻
Deiodination
DIT
TG
TG
Thyroid 2
Peroxidase
+
H2 O2
TG
I⁻
I+
HOI
EOI
TG
Coupling
TG
Endocytosis 3
MIT
DIT
T3
T4
MIT
DIT
COLLOID

Actions

- Growth & development
- Metabolism
- Calorigenesis
- CVS, CNS
- Skeletal muscle
- GIT, Kidney
- Haemopoiesis
- Reproduction

l- thyroxine

- BA – 75%
- Food interferes with absorption
- Administered in empty stomach
- Sucralfate, iron & CA also interferes
- Enzyme inducers accelerate metabolism
- Preferred over liothyronine

Uses – replacement therapy

- Cretinism (8-12 micro gm/kg)
- Adult hypothyroidism (50 to 100-200)
- Subclinical hypothyroidism
- Myxodema coma
- Nontoxic goiter
- Iodised edible salt
- Thyroid nodule, & Ca thyroid
- others

Thyroid inhibitors

- ↓ functional capacity of thyroid gland
- Thyrotoxicosis
- Grave's & toxic nodular goiter

Classification

- Inhibit hormone synthesis(Antithyroid)

  Propylthiouracil (PTU), methimazole, carbimazole
- Inhibit iodide trapping (ionic inhibitors)

  Thiocyanates, perchlorates, nitrates
- Inhibit hormone release

  Iodine, iodides of Na & K,organic iodide

Cont…

- Destroy thyroid tissue

  Radioactive iodine

- Others

  β blockers, Lithium, Amiodarone, Phenoarbitone, Phenytoin, carbamazepine & rifampicin

Antithyroid drugs

- Bind to thyroid peroxidase & prevent oxidation
- Inhibit iodination & coupling
- Thyroid escape & thyroid constipation
- Orally absorbed, cross placenta & enter milk
- Metabolism – liver
- Excretion – urine as metabolites
- Over treatment – hypothyroidism, goiter

  GI upset, hair loss & agranulocytosis

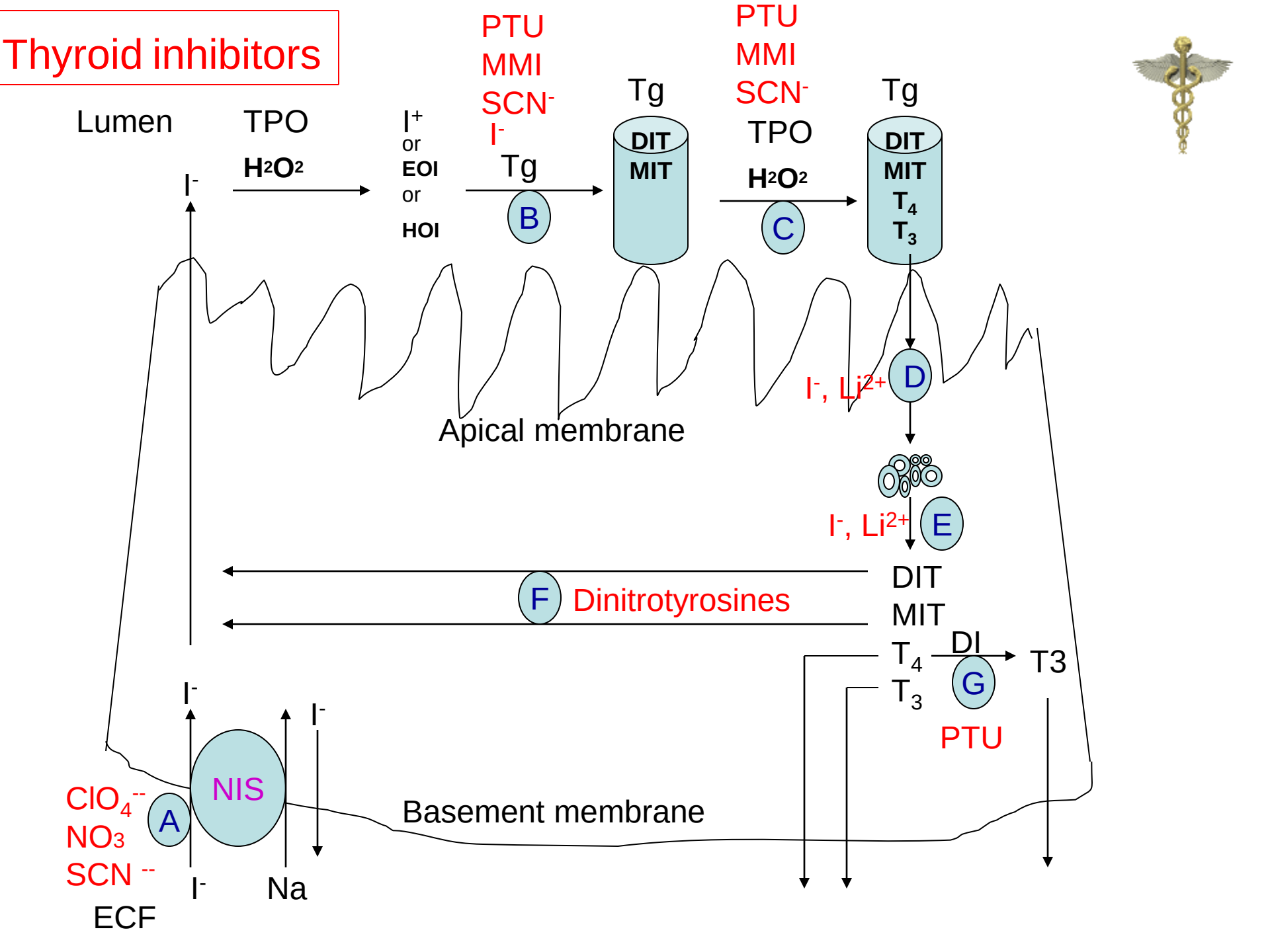
PTU

- High PPB
- Placenta & milk – less
- Plasma t1/2 1-2 hrs
- DOA – 8 hrs
- No active metabolite
- T4 $\xrightarrow{\times}$ T3

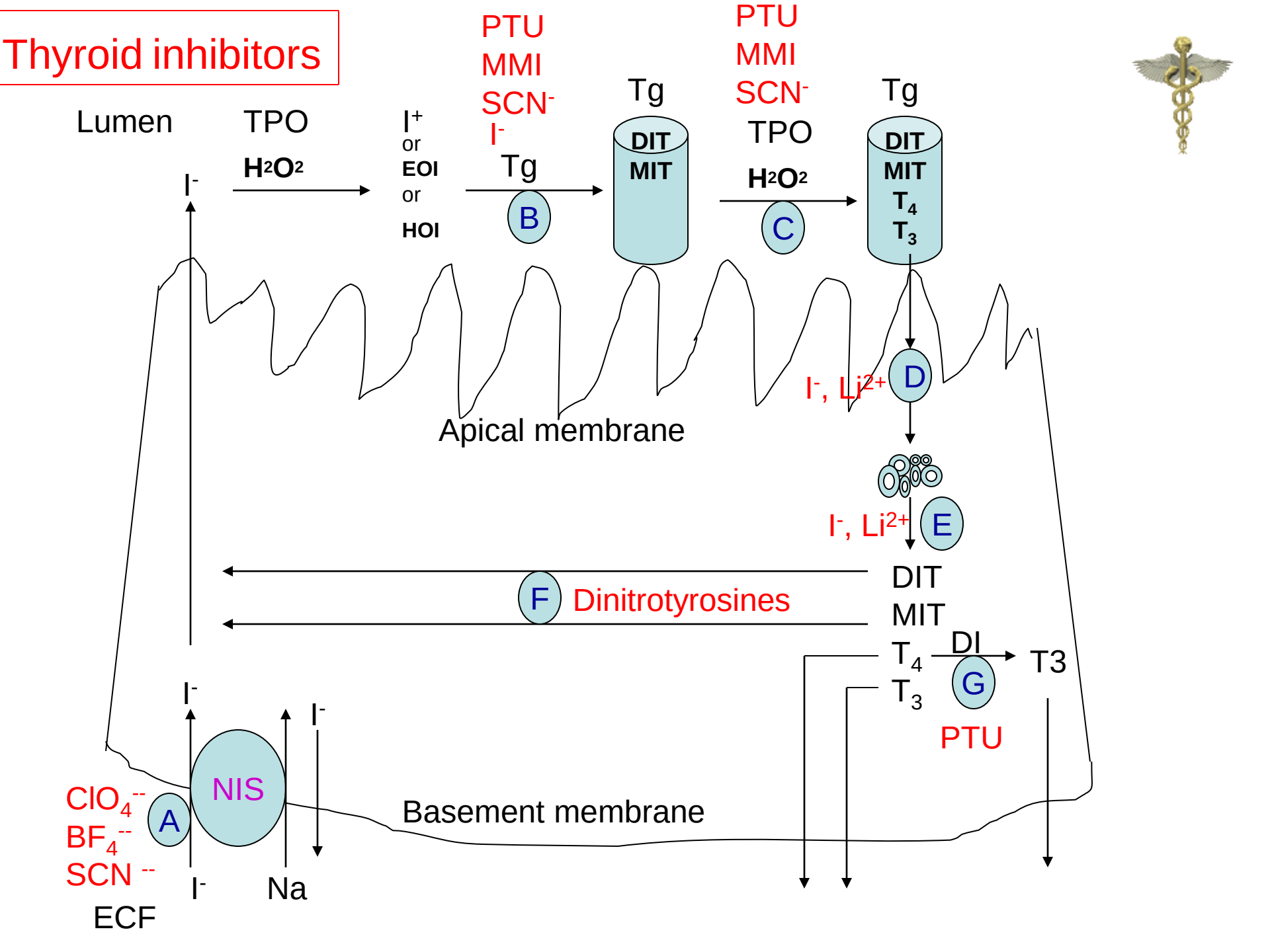
Carbimazole

- Less
- Large amount
- 6 -10hrs
- 12 – 24hrs
- Methimazole
- Does not

Thyroid inhibitors



Thyroid inhibitors



Uses

- Definitive therapy
- Preoperatively
- With radioactive iodine
- Thyroid storm
- Advantages & disadvantages
- Pregnancy- Surgery and radioiodine are Contraindicated

Iodides & iodine

- Preoperative preparation
- Prophylaxis of endemic goiter
- Antiseptic
- Thyroid storm-Lugol's iodine (5% iodine + 10% K iodide solution)
- Hypersensitive reactions
- Iodism, hypothyroidism & goiter
- Flare up acne, foetel/ infantile goiter

Radioactive iodine

- Emits γ rays & β particles
- Concentrated in follicles
- Used as Na salt dissolved in water
- Diagnostic
- Hyperthyroidism(3-6 m curie)
- repeat if needed after 3 months
- Metastatic CA

Advantages &Disadvantages

- Simple, inexpensive & OP treatment
- No surgical risk
- Once controlled, permanent cure

- Hypothyroidism
- Slow response
- Contraindicated in pregnancy
- Not suitable for young patients

Beta blockers

- While awaiting response to carbimazole or radioiodine
- Preoperative preparation along with iodide
- Thyroid storm

Thyroid storm

- Beta blockers
- PTU - 200-300 mg 6th hrly
- Iopanoic acid - 0.5- 1 gm OD
- Corticosteroids (hydrocortisone 100 mg i.v tds followed by oral prednisolne)
- Diltiazem 60-120 mg BD
- General measures