# Thyroid Function Tests Made Ridiculously Simple

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# Objectives

- Thyroid Physiology
- 4 cases: each with common thyroid function test abnormalities
- Summary

# Thyroid Hormone Labs in Review

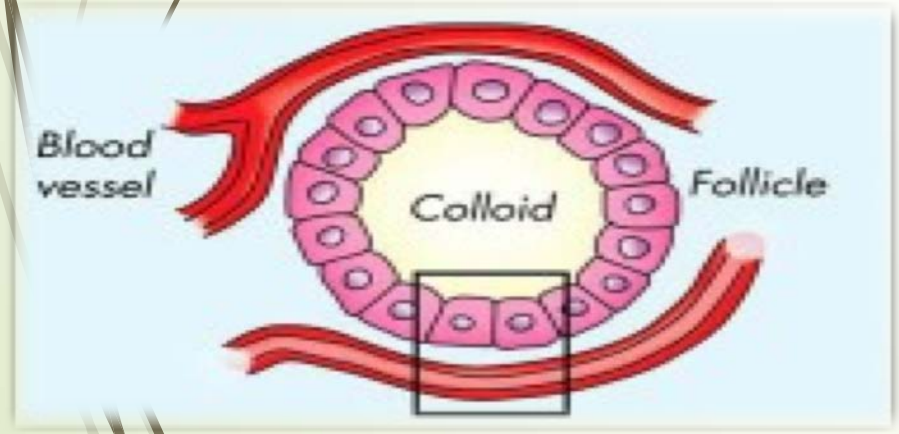
Thyroid Hormone Labs:

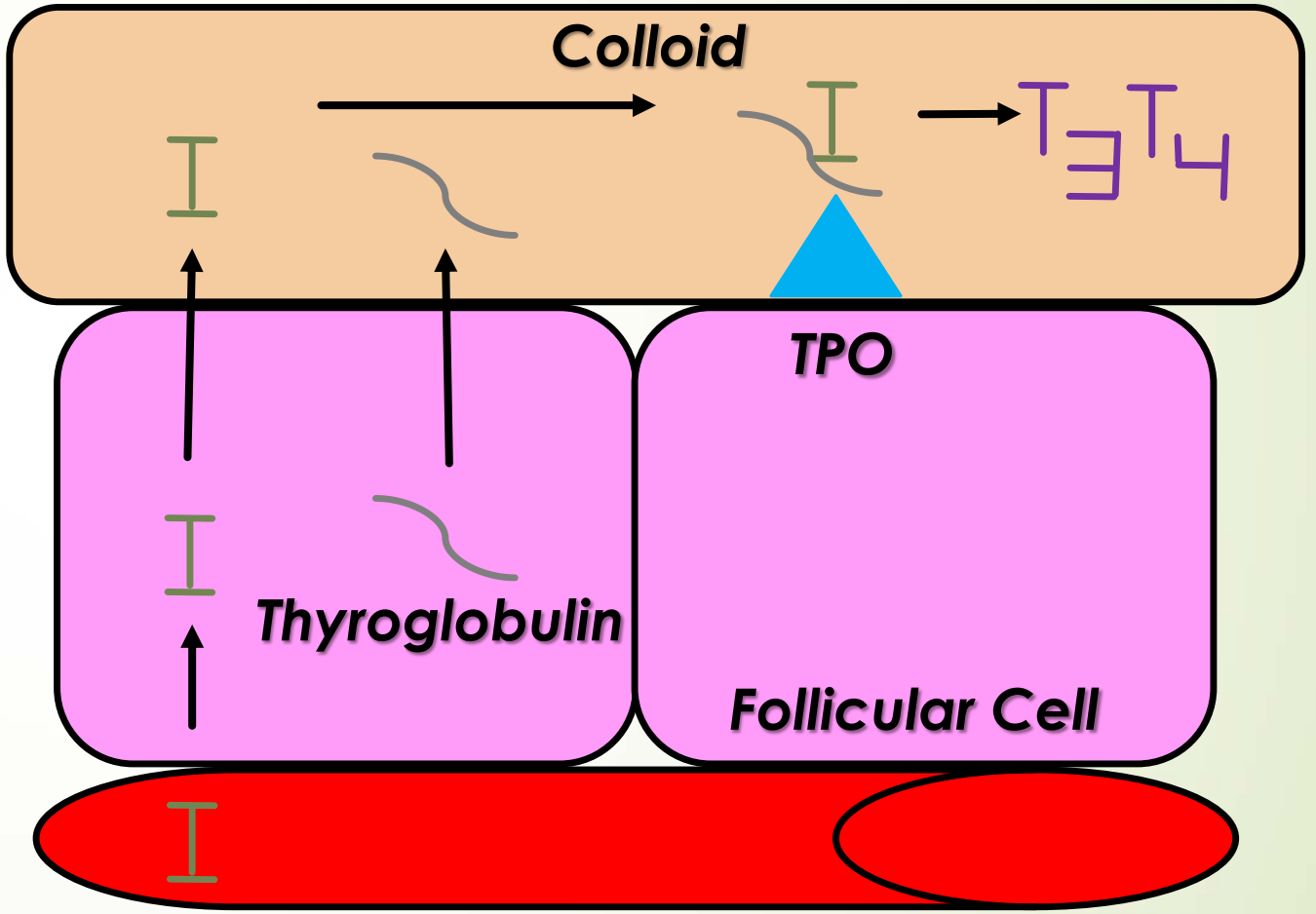
- TSH (Thyroid Stimulating Hormone)
- T4 and T3 are released from the thyroid
  - Majority T4
  - T3 is more potent than T4
  - T3 is also made in periphery by conversion from T4
- Free vs Total Levels
  - Free levels are unbound and bioavailable.
  - The total level is measure of both bound and unbound hormone. These levels fluctuate based on binding protein levels.

# Thyroid Physiology

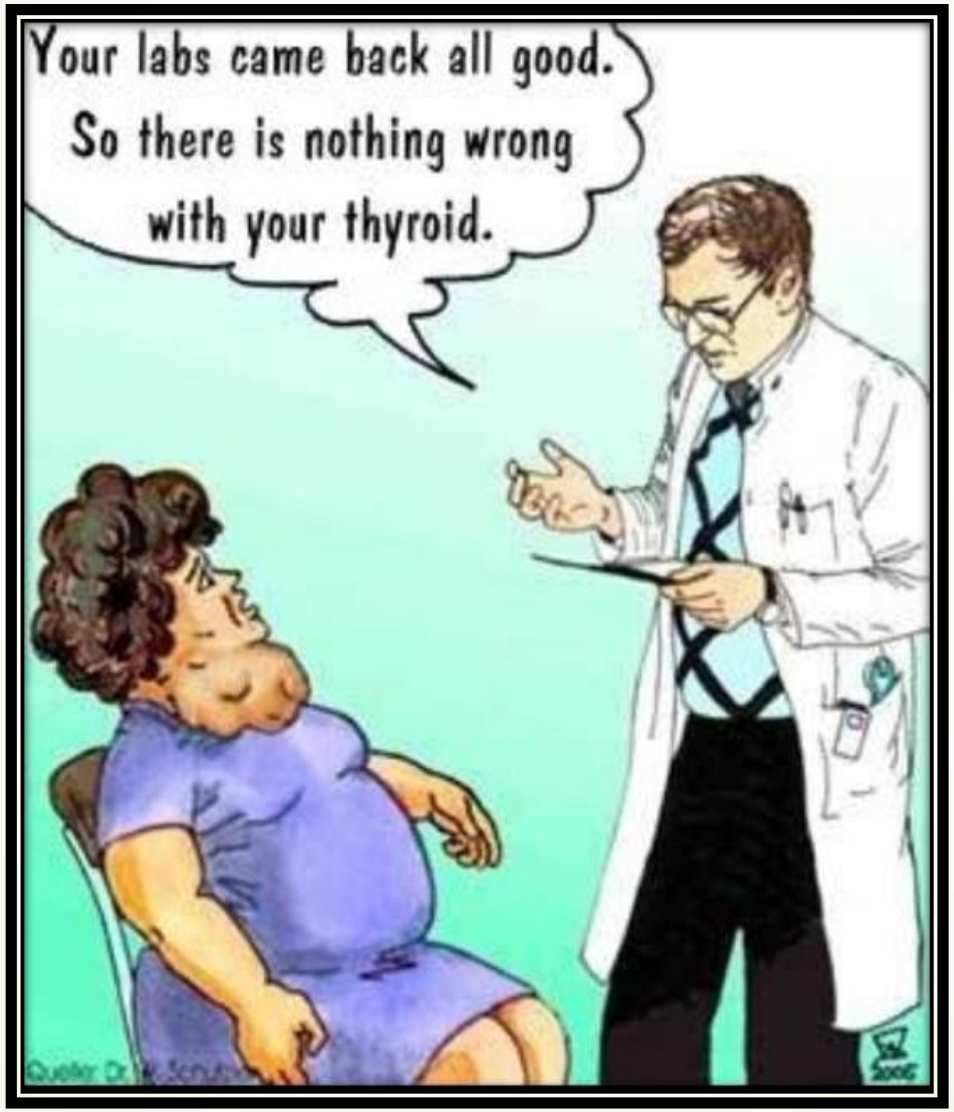
Thyroid Hormone Formation:

- Iodine transported into the colloid
- Thyroglobulin acts as assembly line
  - T4 and T3 are made from pre-cursors (through iodination)
- Thyroid Peroxidase (TPO) catalyzes thyroid hormone production
- TSH binding releases hormone



# Now lets get to some cases!!!



The NEW ENGLAND JOURNAL of MEDICINE

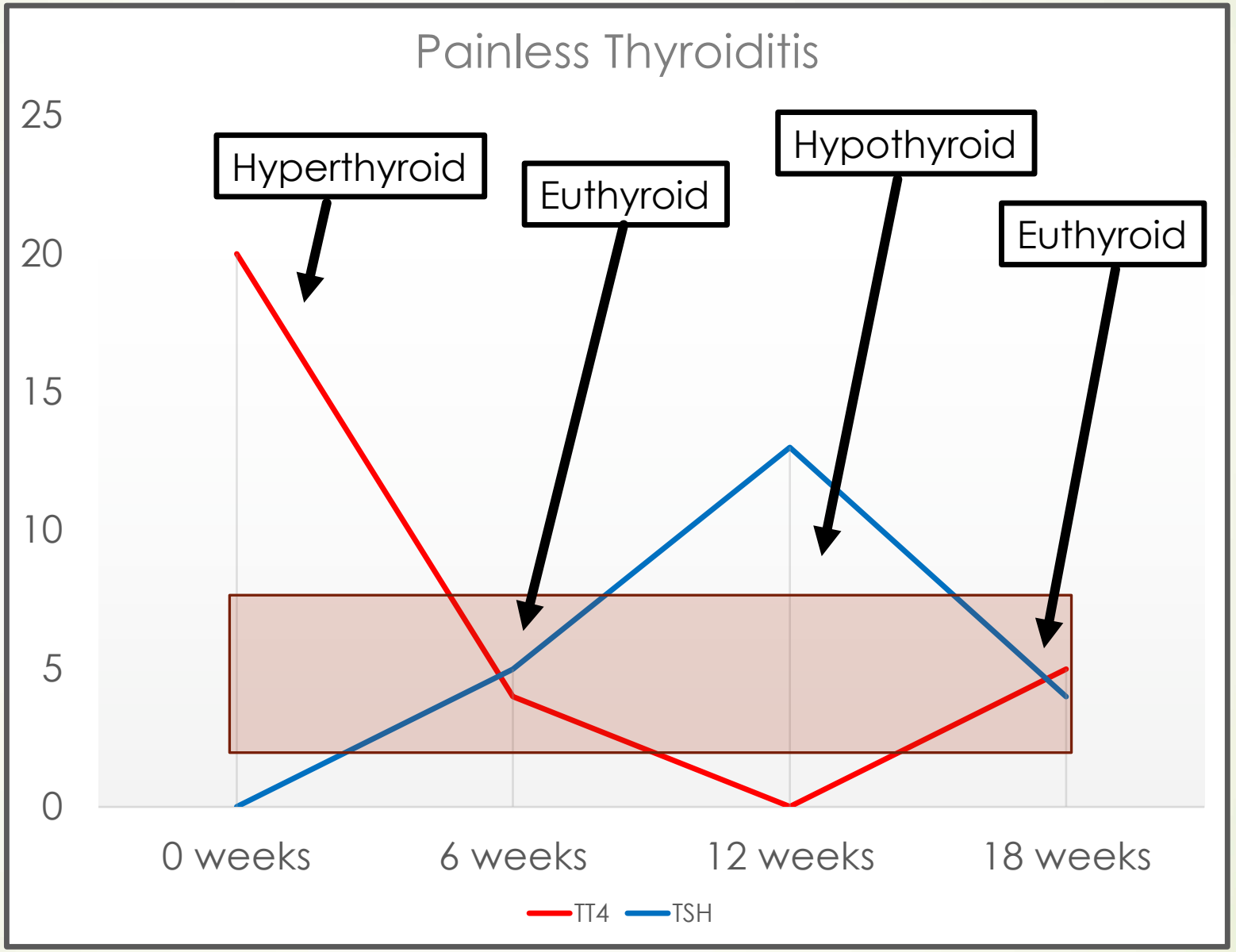
ORIGINAL ARTICLE

# Thyroid Hormone Therapy for Older Adults with Subclinical Hypothyroidism

TRUST TRIAL:

- Randomized controlled trial
- Placebo vs Levothyroxine for the treatment of subclinical hypothyroidism in patients older than 65 years of age (737 adults)
  - Normal free T4
  - TSH 4.6 to 19.9 (Majority <10)
- No difference in outcomes with levothyroxine vs placebo

# Case 2


Painless Thyroiditis
25
20
15
10
5
0
Hyperthyroid
Euthyroid
Hypothyroid
Euthyroid
0 weeks
6 weeks
12 weeks
18 weeks
TT4
TSH

# Case 3

- "54" year old male physician with hypertension and untreated sleep apnea due to non-compliance.
- Presented to PCP for evaluation of chronic fatigue.
- Demands that the thyroid is the cause.
- Vitals are normal.
- Exam is unremarkable.


Medications:
Amlodipine 5 mg

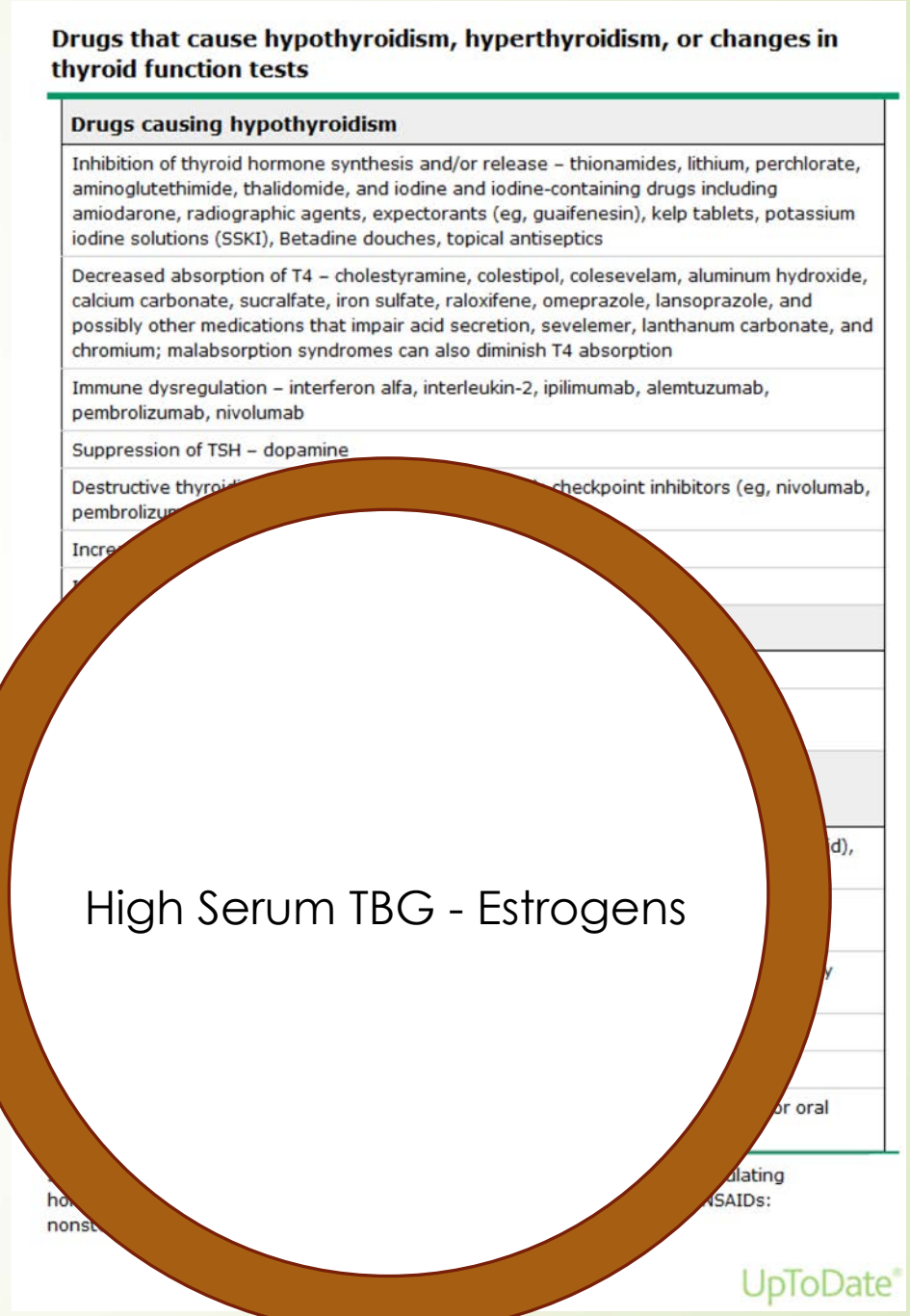
Initial Labs:
TSH 0.02 (low)
Free T4 1.1
T3 0.9

Labs after holding biotin:
TSH 2
Free T4 1.1
T3 0.9

# Case 4

- 27 year old female who has routine labs including thyroid function tests.
- Found to have an elevated total T4 and T3. Otherwise her TSH and Free T4 are normal.
- Asymptomatic

Medications:
OCP containing estrogen



# Summary

- Thyroid physiology is simple. TSH is the key for thyroid hormone production and secretion.
  - Don't forget about central hypothyroidism.
  - Free T3 and Free T4 is the bioavailable hormone
- Non-Thyroidal Illness
- Subclinical hypothyroidism in patients over 65 years old - TRUST trial
- Thyroiditis phases
- Biotin as a cause of laboratory interference
- Estrogen and its affect on thyroid function tests