



Building Blocks of Clinical Practice

Helping Athletic Trainers Build a Strong Foundation

Issue #11: Hypothyroidism



What is the thyroid and its function?

The thyroid is a butterfly shaped gland that lies anterior to the trachea and caudal to the thyroid cartilage at the level of C5-T1.

The thyroid synthesizes and releases thyroid hormones T3 (triiodothyronine) & T4 (thyroxin).¹

- ◆ The thyroid is the only endogenous source of T4.
- ◆ The thyroid only responsible for releasing ~20% of T3, with the remainder of T3 in the body resulting from the peripheral conversion of T4 to T3.²

The release of T3 & T4 is regulated through negative feedback (figure 1).²

- ◆ The hypothalamus releases TRH (thyroid releasing hormone) which stimulates the anterior pituitary to release TSH (thyroid stimulating hormone) which stimulates the thyroid to release T3 & T4 into the blood.
- ◆ When the level of thyroid hormone in the blood reaches a threshold, the release of thyroid releasing hormone (TRH) is inhibited.

T3 and T4 have broad and diverse effects across multiple systems.¹

- ◆ Increases basal metabolic rate, heart rate, cardiac contractility, and cardiac output
- ◆ Alters mental state if levels are abnormal
- ◆ Facilitates brain development

What is hypothyroidism?

Hypothyroidism occurs when there is a¹:

- ◆ Defect in the thyroid gland - *Primary Hypothyroidism*; accounts for 98% of cases
- ◆ Deficiency of TSH secretion - *Secondary Hypothyroidism*
- ◆ Deficiency of TRH secretion - *Tertiary or Hypothalamic Hypothyroidism*

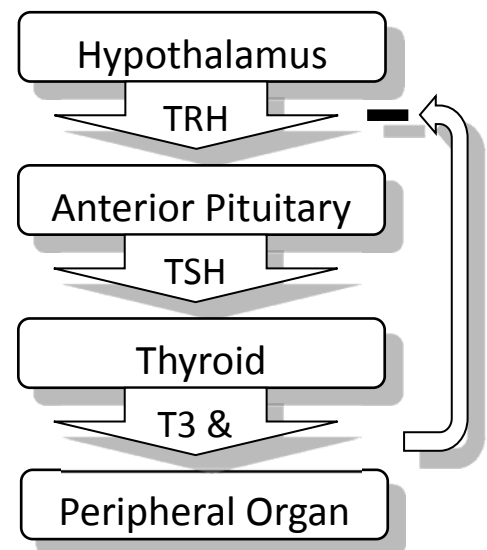


Fig. 1

Subclinical hypothyroidism occurs when there are:

- ◆ Elevated TSH values but free thyroid hormones (T3 & T4) are within normal values (nearly half of those affected will progress to thyroid failure)²

What is the prevalence of hypothyroidism?

In the US population (age 12 and older): Whites, Hispanics, and other ethnicities: 4.6%³

Blacks: 1.7%³

The prevalence in athletes is unknown



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Signs and symptoms of hypothyroidism

In athletes, a decrease in performance is usually the presenting complaint to the clinician.²

Common signs and symptoms in athletes with hypothyroidism.²

Symptoms	Signs
Lethargy	Fluid retention
Cold intolerance	Placid expression
Muscle aches and pains	Bradycardia
Poor athletic performance	Decreased reflexes
	The thyroid gland itself may present normal in size, diffuse enlargement, or may be nonpalpable.

Diagnosis and Treatment

- ◆ Increased serum TSH is the best screening test for diagnosis of primary hypothyroidism in otherwise healthy individuals.¹
- ◆ Levels of specific thyroid hormones and/or thyroid antibodies may also be tested and used to differentiate between different types of hypothyroidism and other thyroid disorders.¹
- ◆ There is no evidence to support routine screening during a pre-participation physical exam.²
- ◆ For primary hypothyroidism, synthetic thyroxine (T4) is usually given (Levothyroxine - generic).¹
- ◆ Due to the individualized nature of dosing, regular and on-going follow-up consultation and testing is needed to ensure dosage is appropriate.
- ◆ There are no definitive guidelines for athletes return to participation following diagnosis, however, for individuals presenting with fatigue or cardiac manifestations a gradual increase in intensity and frequency seems to be the most prudent approach.²

References

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- ⁴ Ciloglu F, Peker I, Pehlivan A, et al. Exercise intensity and its effects on thyroid hormones. *Neuro Endocrinol Lett*. 2005;26(6):830-4.