

Thyroid Gland = Metabolic Gland

1. Which organ regulates the thyroid gland?
2. Targets of thyroxine include:
3. 4 effects I listed for effects on virtually all cells
4. What is thyroxine's effect on the kidneys?
5. How does thyroxine's effect on kidneys increase hematocrit (the percentage of blood that is RBCs)?
6. How does thyroxine affect the Cardiovascular System?
7. Why does someone with hypothyroidism often have a blood test result of elevated TSH?
8. For each symptom of hypothyroidism, give a reason based on thyroxine's effects:
 - pale
 - tired
 - cold
 - Low HR and BP
 - dry skin, hair loss
 - weight gain
 - depression and foggy thinking

Answers:

Thyroid Gland = Metabolic Gland

1. Which organ regulates the thyroid gland?
pituitary gland
2. Targets of thyroxine include:
Nearly all body cells; and specifically kidneys and cardiac muscle
3. 4 effects I listed for effects on virtually all cells that increase ATP production
 - **increase glucose consumption**
 - **increase fatty acid consumption**
 - **increase oxygen consumption**
 - **increase number of mitochondria**
4. What is thyroxine's effect on the kidneys?
Thyroxine stimulates release of erythropoietin (EPO) from the kidneys. This is useful because then more oxygen can be carried to cells for ATP production.
5. How does thyroxine's effect on kidneys increase hematocrit (the percentage of blood that is RBCs)?
EPO causes the bone marrow to make more RBCs, which increases hematocrit.
6. How does thyroxine affect the Cardiovascular System?
Thyroxine causes heart rate and blood pressure to increase.
7. Why does someone with hypothyroidism often have a blood test result of elevated TSH?
The pituitary gland produces more Thyroid stimulating hormone when thyroxine is low. This negative feedback loop is an effort to stimulate the thyroid gland to increase its output of thyroxine.
8. For each symptom of hypothyroidism, give a reason based on thyroxine's effects:
 - **pale due to low hematocrit (thyroxine normally stimulates EPO)**
 - **tired because low metabolic activity means not enough ATP is being produced by cells to meet energy needs**
 - **cold because low metabolic activity means not enough ATP is being produced by cells to generate adequate heat for the body**
 - **Low HR and BP because thyroxine normally directly increases HR and BP**
 - **dry skin and hair loss because low metabolic activity in skin glands and hair follicles means not enough ATP is being produced to produce oil and hair growth**
 - **weight gain because low metabolic activity means that available fat and energy stores are not used to produce ATP. Food calories are stored, but not adequately burned.**
 - **Depression and foggy thinking because low metabolic activity in the brain means not enough ATP is produced for healthy brain function.**