

RAMSADAY COLLEGE, AMTA



AVIRUP CHAKROBORTY

Functions of The Thyroid Hormones

Thyroid hormones affect many diverse tissue and influence major process, such as growth, differentiation and reproduction. These hormones are capable of maximal response to other hormones.

1. Growth

In humans, the effect of thyroid hormones is mainly manifested in fetus and growing children. If the fetus does not secrete sufficient amount of thyroid hormones, growth and maturation of the brain are greatly retarded. The child will remain mentally deficient throughout the life.

Those are hypothyroid, the growth rate will be slow and in case of hyperthyroidism excessive skeletal growth will be observed. Thyroid hormones stimulate somatomedin production, and augment the action of growth hormones.

2. Calorigenic Action

The thyroid hormones increase the metabolic activity of all the tissues of the body. The basal metabolic rate can increase up to 60-100 %, when excessive amount of thyroid hormones are secreted. The rate of protein synthesis is increased and catabolism of protein is also increased. T_3 and T_4 increase the oxygen consumption of all metabolically active tissues. Thyroid hormones also increase the fatty acids metabolism.

T_3 and T_4 increase the number and surface area of the mitochondria in the tissues. Thus increase the formation of ATP. Increased ATP production causes elevation of metabolic activity.

3. Metabolic activities

These hormones have specific effects to carbohydrate, fat and protein metabolism, which are discussed below;

Carbohydrate metabolism

Thyroid hormone stimulates rapid uptake of glucose by the cells. Increased glycolysis and gluconeogenesis are observed due to thyroid hormone function. It increases insulin secretion, which has a secondary effect on carbohydrate metabolism.

Fat metabolism

Thyroid hormone has great influence on fat metabolism. The oxidation of free fatty acids is greatly accelerated due to increased amount of fatty acids concentration in the blood. Increased amount of plasma cholesterol, phospholipids and triglycerides level are observed in hyperthyroidism. The thyroid hormone induces increased number of low density lipoprotein receptor in the liver, causes rapid removal of low density lipoprotein from the plasma by the liver, and subsequent synthesis of cholesterol in these lipoprotein by the liver cells.

4. Effect on cardiovascular system

Increased blood flow and cardiac output

Increased metabolism in the tissues causes more rapid utilization of oxygen than normal and release of greater than normal quantities of metabolic end product from the tissues. These effects cause vasodilatation in most tissues, thus increasing blood flow. The rate of blood flow in the skin especially increases because of the increased need for heat elimination. As a consequence of the increased blood flow, cardiac output also increases, sometimes rising to 60% or more above normal when excessive thyroid hormone is present and falling to only 50% of normal in very severe hypothyroidism.

Increased Heart Rate

The heart rate increases considerably more under the influence of thyroid hormone than would be expected from the increase in cardiac output. Therefore thyroid hormone seems to have a direct effect on excitability of the heart, which in turn increases heart rate.

Increased Heart Strength

The increased enzymatic activity caused by increased thyroid hormone production apparently increases the strength of heart when a slight excess of thyroid hormone is secreted. However

when thyroid hormone is increased markedly, the heart muscle strength becomes depressed because of long-term excessive protein catabolism.

5. Increased Respiration

The increased rate of metabolism increases the utilization of oxygen and formation of carbon dioxide; these effects activate all mechanism that increase the rate and depth of respiration.

6. Effect on the function of the Muscles.

Slight increase in thyroid hormone usually makes the muscles react with vigor, but the quantity hormone becomes excessive, the muscles become weekend because of excessive protein catabolism. Conversely lack of thyroid hormone causes the muscle to become sluggish, and they relax slowly after a contraction.

7. Effect on Sleep

Because of exhausting effect of thyroid hormone on the musculature and on the central nervous system, the hyperthyroid subject often has a feeling of constant tiredness, but because of the excitable effect of thyroid hormone on synapses, it is difficult to sleep. Conversely, extreme somnolence is characteristic of hypothyroidism, with sleep sometimes lasting 12-14 hours a day.

8. Effect of Thyroid Hormone on Sexual Function.

For normal sexual function, thyroid secretion needs to be normal. In men, lack of thyroid hormone is likely to be cause of libido; great excess of the hormone, however sometimes cause impotence.

In women, lack of thyroid hormone often causes menorrhagia and polymenorrhea – that is, respectively, excessive and frequent menstrual bleeding.