

HPT Axis and the Thyroid Hormones



Hypothalamus

TRH neurons are located in the periventricular nucleus (PVN) of the hypothalamus. TRH is released into the hypophyseal portal circulation influencing TSH release by the pituitary. TRH synthesis and release is under the negative feedback of circulating thyroid hormones (T3 and T4), as well as the control by neurotransmitters and neuropeptides.

↓ TRH

Pituitary

TSH is synthesized and released in response to TRH from the hypothalamus and thyroid hormone feedbacks on the pituitary cells producing TSH (thyrotrophs).

↓ TSH

Thyroid gland.

Within the gland, thyroid hormone is synthesized in the follicle, the functional unit of the thyroid. Iodine is transported into the gland by the sodium-iodide symporter (NIS) where, in the follicular lumen, thyroid peroxidase (TPO) catalyzes the formation of T3 and T4. The synthesis and release of T3 and T4 is under the control of TSH.

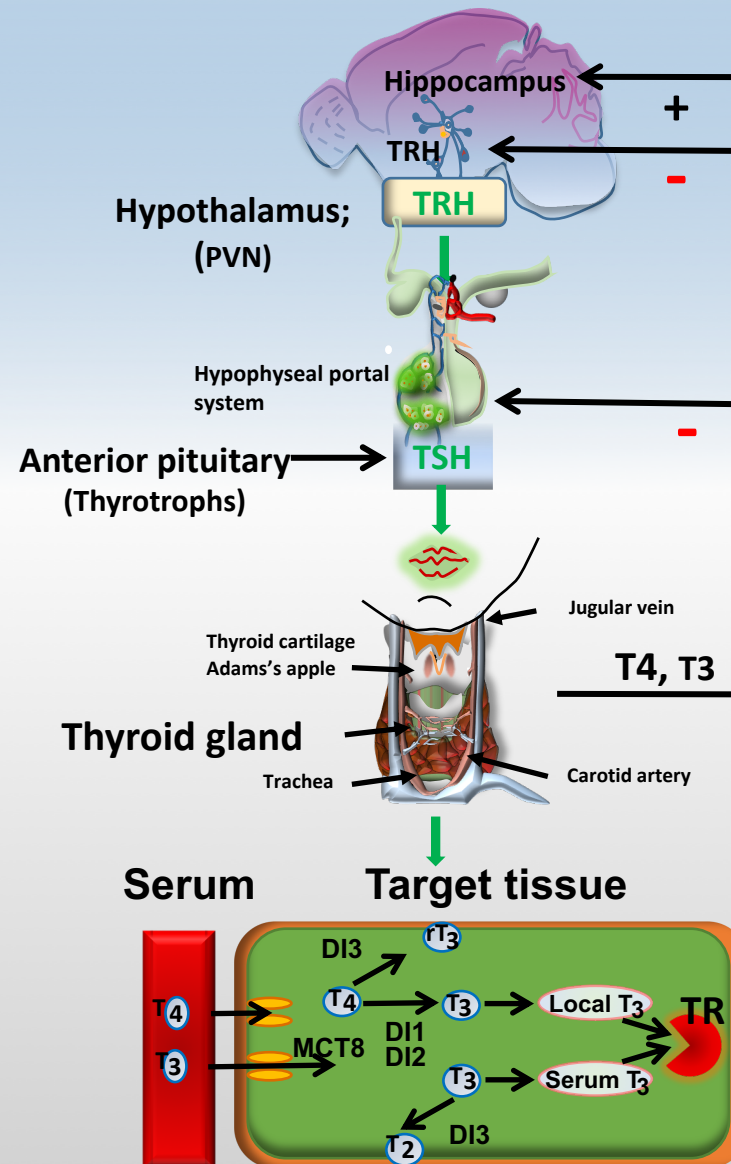
↓ T4, T3

Target tissues/Metabolism

Target tissues contain deiodinases (DIO1, DIO2 & DIO3). DIO1 and 2 deiodinate T4 to T3, the active hormone which binds to the thyroid receptor (TR) to influence cellular function. DIO3 deiodinates T3 to inactive metabolites. Liver enzymes play a key role in TH metabolism

TRH: Thyroid releasing hormone
TSH: Thyroid stimulating hormone

T3: Triiodothyronine
T4: Thyroxine



The hypothalamic-pituitary-thyroid (HPT) axis regulates the concentrations of thyroid hormone in the circulation. The HPT axis regulates a diverse range of biological activities, including metabolism/energy expenditure (the body's basal metabolic rate or how quickly the cells use the energy stored within them), brain development, adult brain function; appetite; thermogenesis, cardiovascular, bone and liver function; protein synthesis, and the mobilization of fat and glucose stores.

Because the HPT is dependent on dietary iodide and the axis itself presents a number of potential molecular targets for xenobiotics, regulatory agencies are actively seeking improved methods for the detection HPT disruption. Dr. Cooper is familiar with the current regulatory tests for thyroid active chemicals.

With a thorough understanding of the design and interpretation of the "thyroid sensitive" assays, let the experts at QS³ assist you with the evaluation of your test chemical on this critical endocrine axis governing growth, development and long term energy homeostasis.