Total Thyroxine (T4)

Method:	Access Chemiluminescent Immunoassay
Kit Manufacturer:	Beckman Coulter, Fullerton, CA
Description:	The clinical importance of total T4 determination is in the diagnosis and confirmation of thyroid disorders. Elevated levels of T4 occur in Graves' disease, subacute thyroiditis, toxic nodule, or secondary (pituitary) hyperthyroidism. Decreased levels occur in primary hypothyroid diseases such as Hashimoto's thyroiditis and neonatal hypothyroidism or secondary hypothyroidism due to defects at the hypothalamic-pituitary level. The hypothalamic-pituitary-thyroid axis controls thyroid hormone synthesis, release and action. Thyrotropin-releasing hormone (TRH) secreted from the hypothalamus stimulates the synthesis and release of thyrotropin or thyroid stimulating hormone (TSH). TSH, in turn, stimulates the synthesis, storage, secretion, and metabolism of thyroxine (T4) and triiodothyronine (T3). The essential features of thyroid hormone production and storage are: iodine uptake; iodination of tyrosine residues in the thyroglobulin molecule; coupling of the monoiodotyrosines (MIT) and diiodotyrosines (DIT) to form T4 and T3; storage of the thyronines as thyroglobulin in the thyroid gland; and release of thyroid hormones into the circulation. Once released into the circulation, most of the T4 and T3 are bound to carrier proteins. The greatest binding affinity for both hormones is to thyroxine-binding globulin (TBG) and, to a lesser extent, to prealbumin (TBPA). As a result, 99.97% of circulating T4 and 99.7% of circulating T3 bind leaving only small portions unbound. T4 and T3 regulate normal growth and development. They maintain body temperature, stimulate calorigenesis and affect all aspects of carbohydrate metabolism as well as certain areas of lipid and vitamin metabolism. Fetal and neonatal development also require thyroid hormones. Thyroxine is commonly measured in human serum as total T4, measuring both bound and free T4. It is used as a thyroid screening test alone or in conjunction with other thyroid tests. Measurement of total T4 gives a reliable reflection of clinical thyroid status in the absence of binding abnormalities. However, changes in binding proteins can occur which affect the level of total T4 but leave the level of unbound hormone unchanged. The Access Total T4 assay is a competitive binding immunoenzymatic assay. A sample is added to a reaction vessel with anti-thyroxine antibody, thyroxine-alkaline phosphatase conjugate, and paramagnetic particles coated with goat anti-mouse capture antibody and a stripping agent to dissociate all T4 from binding proteins. Thyroxine in the sample competes with the thyroxine-alkaline phosphatase conjugate for binding sites on a limited amount of specific anti-thyroxine antibody. Resulting antigen: antibody complexes bind to the capture antibody on the solid phase. After incubation in a reaction vessel, materials bound to the solid phase are held in a magnetic field while unbound materials are washed away. Then, the chemiluminescent substrate is added to the vessel and light generated by the reaction is measured with a luminometer. The light production is inversely proportional to the concentration of thyroxine in the sample. The amount of analyte in the sample is determined from a stored, multi-point calibration curve.

Collection and Performance Characteristics

Tube type:	Preferred: SST Alternate: Heparin Plasma
Minimum Volume:	0.5 mL
Special Processing Considerations	Thaw samples only once.
Lowest Reportable Value:	0.50 ug/dL
Dynamic range:	0.50 – 30.0 ug/dL

Precision:	Intra-assay variation is 2.7 – 4.1% Inter-assay variation is 4.9 – 7.2%
Reference Range:	6.09-12.23 µg/dL