Parathyroid Glands and Hormones Encyclopedia Article

Parathyroid Glands and Hormones

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Parathyroid Glands and Hormones

Parathyroid glands are found on the posterior surface of the thyroid gland. Normally, there are four parathyroids, averaging 120 mg in total mass but as many as 5% of normal individuals have more than four. The two superior parathyroids are found near the upper poles of the thyroid and the two inferior glands are near the lower poles. Parathyroid glands can be found in aberrant locations such as the tracheoesophageal groove, the retroesophageal space and the anterior **mediastinum**.

Parathyroid glands produce and secrete parathyroid hormone (PTH) that, together with vitamin D is the principle regulator of **calcium** ion (Ca^{+2}) in **extracellular fluid**. PTH is synthesized in the parathyroids as a "preprohormone" which is cleaved to give a prohormone. Further cleavage yields the 84 amino acid hormone, PTH.

Maintenance of extracellular Ca^{+2} within narrow limits is essential to the proper function of many tissues. It is responsible for cardiac and **skeletal muscle** contraction and relaxation. Excess calcium can lead to **heart** arrhythmias, muscle twitches and cramps. Calcium concentration is key to the secretory activity of practically all endocrine and exocrine glands. It is a primary factor in **blood** clotting and an important regulator of many cellular enzyme activities.

Disturbance in calcium homeostasis can lead to a wide variety of disease states including **hyperthyroidism**, hypothyroidism, **osteoporosis**, Paget's disease, renal disease, rickets and pancreatitis.

PTH regulates extracellular Ca^{+2} within very narrow limits. When circulating Ca^{+2} levels fall, the parathyroids are stimulated to secrete PTH. Conversely, when Ca^{+2} levels rise above **equilibrium**, there is evidence for intracellular degradation of synthesized PTH. Secretion of PTH can be inhibited by high extracellular magnesium ion concentrations. The presence of the active metabolite of vitamin D (dihydroxycholecalciferol) also suppresses PTH secretion and action.

PTH acts directly on kidney and bone. This action results from the binding of PTH to specific membrane-bound receptors on target cells of both **organs**. In the kidney, PTH increases the reabsorption of calcium (and magnesium) ions from the glomerular filtrate into the blood, increases excretion of phosphate and bicarbonate ions via urine and activates the enzyme that forms dihydroxycholecalciferol. In bone, PTH causes release of calcium and phosphate into the extracellular fluid by acting directly on the osteoblasts.

The hormone acts indirectly on the small intestine to maintain normal concentrations of serum Ca^{+2}. The stimulation of dihydroxycholecalciferol causes increased absorption of calcium by the epithelial cells of the intestinal lumen into the bloodstream.