Parathyroid hormone

- Most individuals possess four parathyroid glands situated posteriorto the upper and lower lobes of the thyroid. These glands secrete parathyroid hormone (PTH). Calcium is approximately 50% ionically bound to albumin, and it is the unbound ionised plasma calcium levels which regulate the secretion of PTH, increased calcium concentration suppressing secretion and low levels stimulating it.
- PTH is an 84-amino acid straight-chain polypeptide which acts on hormone Specific receptors on target tissue cells.
- PTH acts on the renal tubular transport of calcium and phosphate and also stimulates the renal synthesis of 1,25-dihydroxycolecalciferol.
- PTH and vitamin D act to maintain plasma calcium levels within the normal range. PTH increases distal tubular reabsorption of calcium and decreases proximal and distal tubular reabsorption of phosphate. The effects of PTH on bone are complex. The two major cell types in bone are osteoblasts and osteoclasts. Osteoblasts are responsible for the synthesis of extracellular bone matrix and priming of its subsequent mineralisation. Osteoclasts decalcify and digest the protein matrix of bone, liberating calcium.
- PTH stimulates osteoclast- mediated bone resorption but, in addition, has an anabolic effect on bone, with an increase in osteoblast number and function.

Calcitonin

Calcitonin is a hormone that is produced and released by the C-cells of the thyroid gland. Its biological function in humans is to have a relatively minor role in calcium balance.

Calcitonin is a hormone that is produced in humans by the parafollicular cells (commonly known as C-cells) of the thyroid gland. Calcitonin is involved in helping to regulate levels of calcium and phosphate in the blood, opposing the action of parathyroid hormone. This means that it acts to reduce calcium levels in the blood. However, the importance of this role in humans is unclear, as patients who have very low or very high levels of calcitonin show no adverse effects.

Calcitonin reduces calcium levels in the blood by two main mechanisms:

1. It inhibits the activity of osteoclasts, which are the cells responsible for breaking down bone. When bone is broken down, the calcium contained in the bone is released into the bloodstream. Therefore, the inhibition of the osteoclasts by calcitonin directly reduces the amount of calcium released into the blood. However, this inhibition has been shown to be short-lived.

2. It can also decrease the resorption of calcium in the kidneys, again leading to lower blood calcium levels.

Manufactured forms of calcitonin have, in the past, been given to treat Paget's disease of bone and sometimes hypercalcaemia and bone pain. However, with the introduction of newer drugs, such as bisphosphonates, their use is now very limited.