



Parathyroid Hormone

Dept. of Pharmacology, GMC
Amritsar

1

PTH- History

- Sandstrom- 1880, gland discovery
- GLEY- 1890, effects of extirpation with thyroid
- Vassale and Generali– removed only parathyroid glands and observed: tetany, convulsions and death
- Ma Cullum and Voegthin- 1990 observed effects of parathyroidectomy on plasma calcium
- Parathyroid tumors- skeletal changes of osteitis fibrosa cystica
- Human, porcine , bovine

Dept. of Pharmacology, GMC
Amritsar

2

PTH- synthesis, secretion, immunoassay

- Prehormone form parathyroid hormone
- Parathyroid hormone formed moves to golgi apparatus for conversion to PTH
- PTH resides within secretory granules
- Hypocalcemia, more PTH secreted
- Prolonged hypocalcemia, gland \uparrow

PTH

- Half life in plasma 2-5 minutes
- 95% elimination by liver & kidney
- Immunoradiometric assays, using two monoclonal antibodies directed against aminocarboxy terminals for accurate measurement of intact PTH

PTH- Regulation of secretion

- Calcium per se regulate parathyroid gland growth, hormone synthesis and secretion
- Plasma Ca^{++} conc. regulates secretory activity
- $\downarrow \text{Ca}^{++}$, $\uparrow \text{PTH}$ hypertrophy and hyperplasia
- $\uparrow \text{Ca}^{++}$ $\downarrow \text{PTH}$
- Plasma membrane associated calcium sensor on parathyroid cell surface
- Binding of Ca^{++} to sensor $\downarrow \text{PTH}$
- Hypercalcemia – \downarrow I/c cAMP & PKC
- Hypocalcemia – \uparrow PKC

Pharmacodynamics

- \uparrow plasma ionic calcium conc.
- Bone
- Kidney
- Intestine

PTH- Effects on Bone

- Mobilizes calcium and phosphorous from old bones into ECF by promoting osteoclastic bone resorption using vitamin D
- Ionic exchange of calcium between ECF and newly laid down bone mineral remains unaffected
- Conc. of ECF \uparrow Ca^{++}
- Skeletal target cell is osteoblast
- PTH recruits osteoclast precursor cells into forming new bone remodeling units
- cAMP production in osteoblasts increases

PTH- Effects on Kidneys

- **Rapid onset of action than bones resorption**
- **\downarrow urinary Ca^{++} excretion**
- **\uparrow urinary excretion of phosphorus**
- **Converts Vit. D to calcitriol in kidney**
- **Vit. D is prohormone, calcitriol is hormone**
- **Enhances efficiency of Ca^{++} reabsorption**
- **\uparrow conversion of Vit. D to calcitriol**
- **\uparrow Ca^{++} conc., \downarrow phosphate**
- **Calcitriol interacts with specific high affinity receptor in intestine , \uparrow plasma Ca^{++} conc. by improving gut Ca^{++} absorption**

PTH

- Promotes active absorption of Ca^{++} and phosphorus from GIT with Vit.D
- \uparrow Renal excretion of inorganic phosphate by decreasing reabsorption
- \uparrow excretion of water, amino acids, citrate, K^+ , HCO_3^- , Na^+
- \uparrow Synthesis of calcitriol
- \downarrow Conc. of Ca^{++} in milk and saliva

Hypoparathyroidism

- Rare cause of hypocalcemia
- Follows operation on thyroid and parathyroid
- Genetic or autoimmune
- Paraesthesia in extremities
- Tetany, muscle spasms of hand and feet, laryngospasm, generalized convulsions
- Spasm of ciliary muscle, iris, esophagus, intestine, urinary bladder, bronchi
- Emotional liability, anxiety, depression
- Calcification of basal ganglia

Hyperparathyroidism

- Primary hyperparathyroidism:

↑ PTH, calcium and ↓ phosphate

- Secondary hyperparathyroidism:

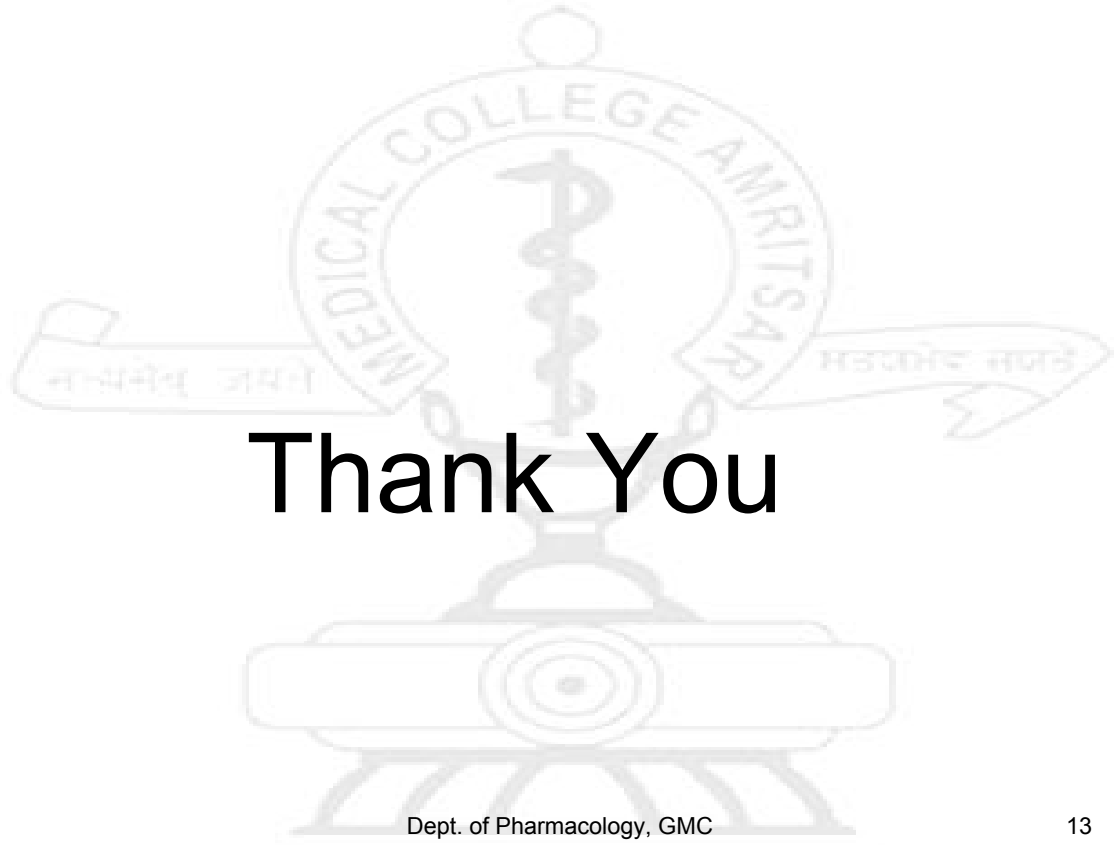
↑ PTH and hypercalcaemia

PTH- Uses & ADRs

- Diagnosis of pseudohypoparathyroidism with hypoparathyroidism
- Treatment of hypoparathyroidism
- Osteoporosis

ADRs:

Hypercalcemia, urticaria, anaphylaxis



Thank You

Dept. of Pharmacology, GMC
Amritsar

13