Other Endocrinology Systems

Topics

- Calcium balance
- Adrenal Hormones (other than cortisol)
- Neurotransmitter/Horomone Crossovers
- GI hormones

Calcium Homeostasis-Revisited!

- Largely regulated by parathyroid glands
  - Sensitive to iCa^{2+}
- PTH has 3 jobs
  - Increase Ca reabsorption in kidney
  - Increase Ca resorption from bone
  - Increase vitamin D activation in kidney

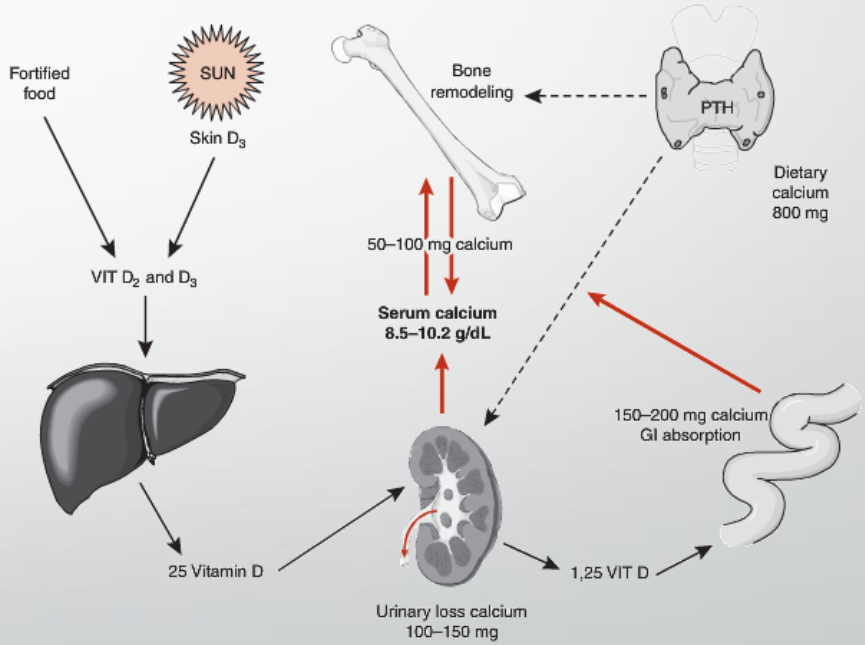
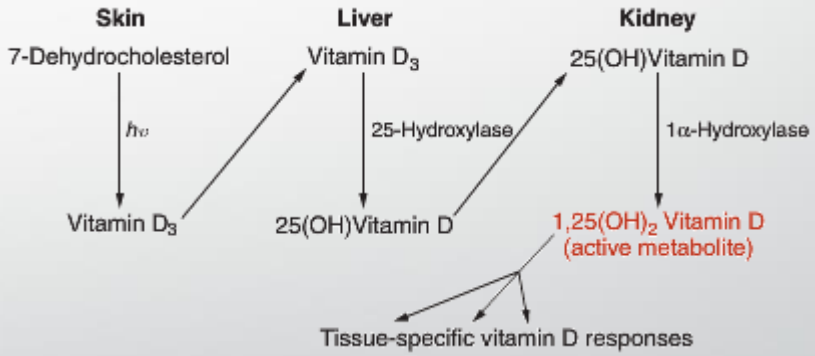


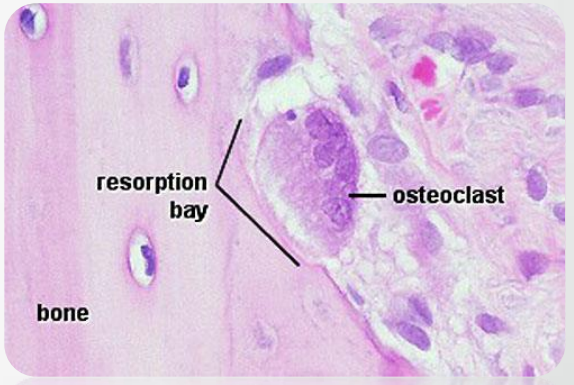
FIGURE 24-5 Organ system integration of calcium homeostasis.

Calcium Homeostasis-Revisited!

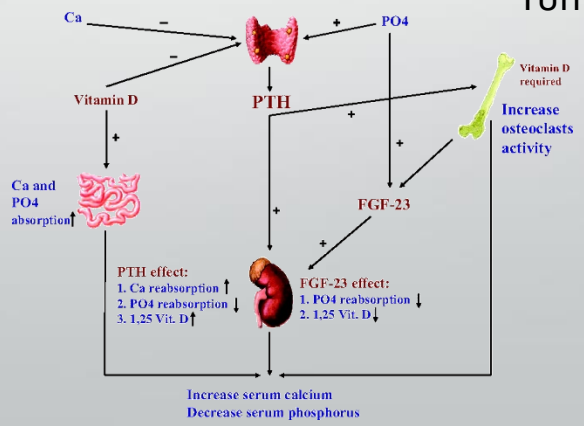
- Vitamin D
  - 1,25 $(OH)_2$-D is active
  - Promotes active intestinal absorption
    - Also phosphate
  - Promotes osteoclast formation



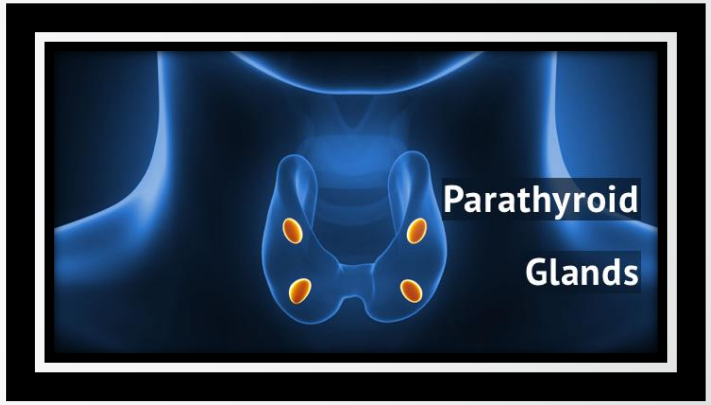
Hypercalcemia



- Parathyroid-related
  - 1º HPT
  - 2º/3º HPT Renal patients over-stimulate PT
  - Calcium sensing receptor faulty
- Cancer-related
  - PTHrP produced by cancers
  - Lymphomas activating vitamin D
  - Tumor cytokines cause bone resorption



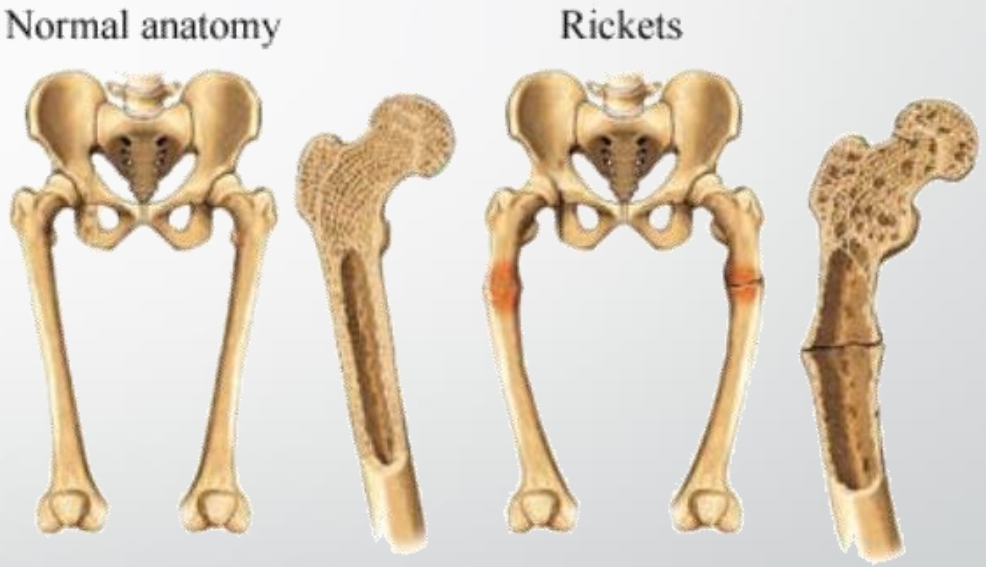
Hypocalcemia



- Parathyroid-related
  - Post-surgical
  - Auto-immune
  - Pseudo-hypoparathyroidism
  - Autoimmune destruction of PT
- Absorption issue
  - Vit. D def.
  - Bowel resection
  - sprue

Bone Pathologies

- Rickets/Osteomalacia
  - Age dependent
  - Rickets- bent long bones (bowlegged)
  - May have low Ca (2ºHPT may compensate)
- Osteoporosis (weak bones)
  - No biochemical diagnosis, lots of fractures
    - Urine NTx product of bone resorption



Adrenal Hormones

- Adrenal Steroids by Zone
  - Glomerulosa- Aldosterone controlled by angiotensin II
  - Fasiculata-Cortisol controlled by ACTH
  - Reticularis-DHEA-S

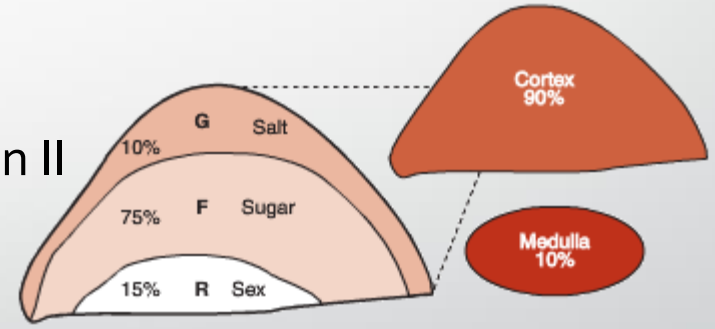
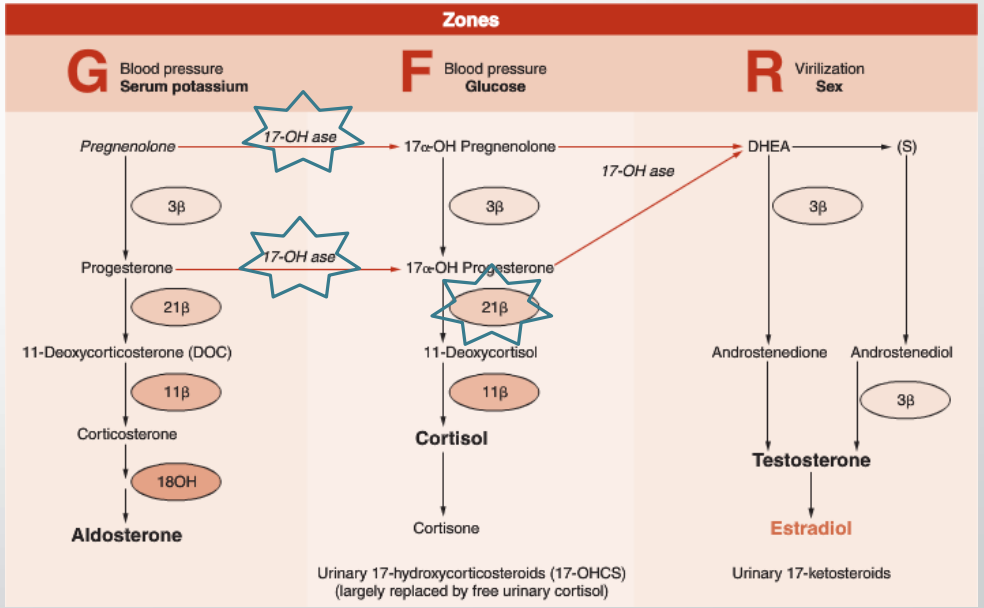


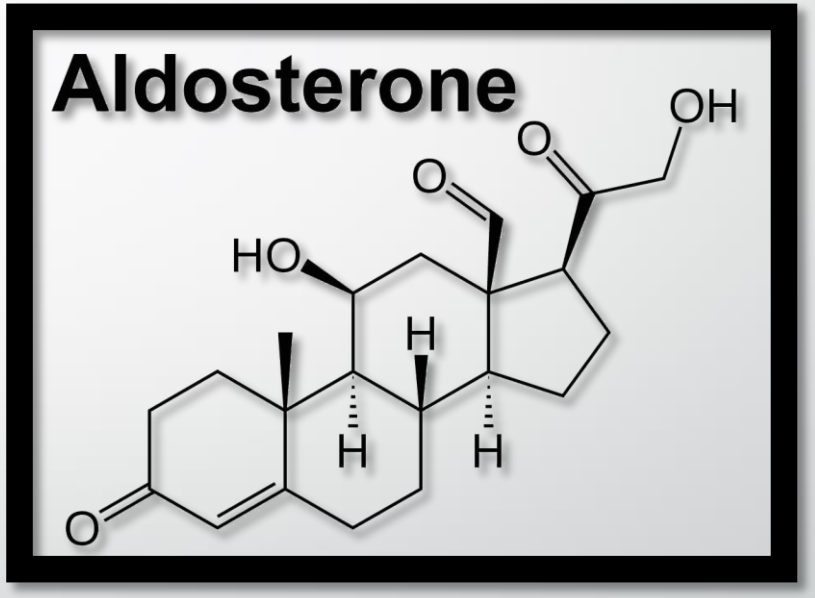
FIGURE 21-1 Adrenal gland by layer.

Congenital Adrenal Hyperplasia

- Enzyme deficiency
  - 21-hydroxylase (95%)
    - ACTH, CRH go to try and bring up low cortisol
    - Adrenal gland hyperplasia
      - Excessive androgens (DHEA-S) produced as result
- 17α-hydroxylase
  - All pregnenolone/progesterone shunted to aldosterone



Hyperaldosteronism



- 1º- Autonomous overproduction
  - Pt presents with HTN
    - Urinary K+ high, plasma low (also $K^+_{Ur} > Na^+_{Ur}$)
    - Aldosterone:Renin > 25
    - Adrenal vein sampling superior to CT for localization and diagnosis

Hyperaldosteronism

- 2º-Renin is increased, causing rest of RAS system to increase
  - Renin-producing tumors, renal artery stenosis, hepatorenal syndrome, diuretics
- Pseudo- Problems with kidney cause K+ loss
  - Aldosterone usually LOW
  - Renal tubular disease, stress, "high renin HTN"

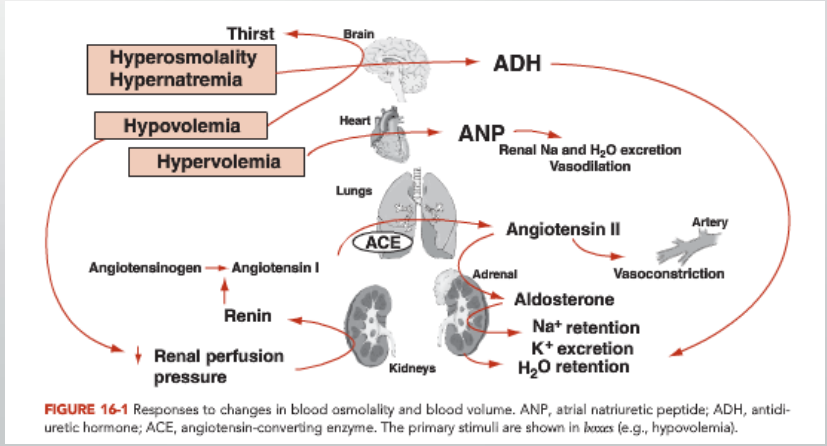


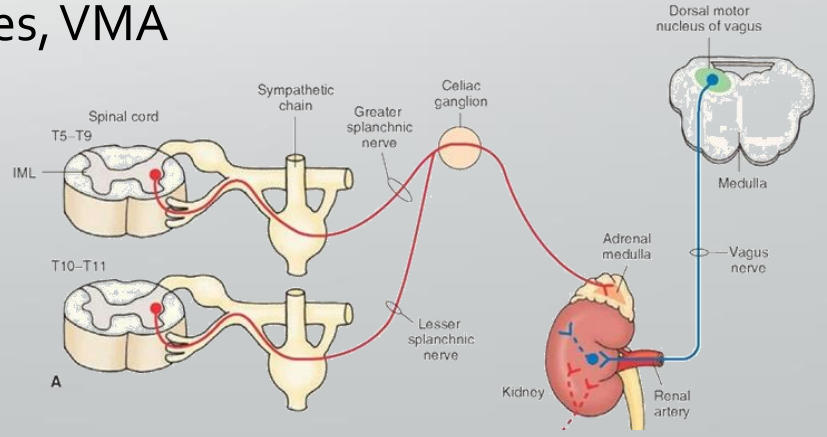
FIGURE 16-1 Responses to changes in blood osmolality and blood volume. ANP, atrial natriuretic peptide; ADH, antidiuretic hormone; ACE, angiotensin-converting enzyme. The primary stimuli are shown in boxes (e.g., hypovolemia).

Hypoaldosteronism

- Part of larger adrenal insufficiency (Addison's)
  - 1º sees all adrenal hormones decreased
  - 2º usually only cortisol will be low

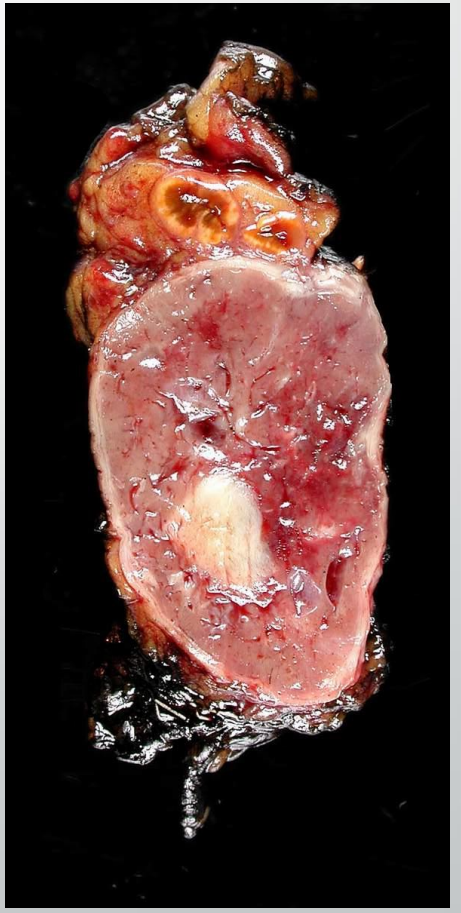
Neurotransmitter/Hormone Crossover

- Adrenal Medulla acts as extension of sympathetic CNS
  - Chromaffin cells produce, store catecholamines (NE, EPI)
    - Circulate 50% bound
    - ½ life of seconds to minutes
  - Once it reaches target cells, changed to metanephrines, VMA



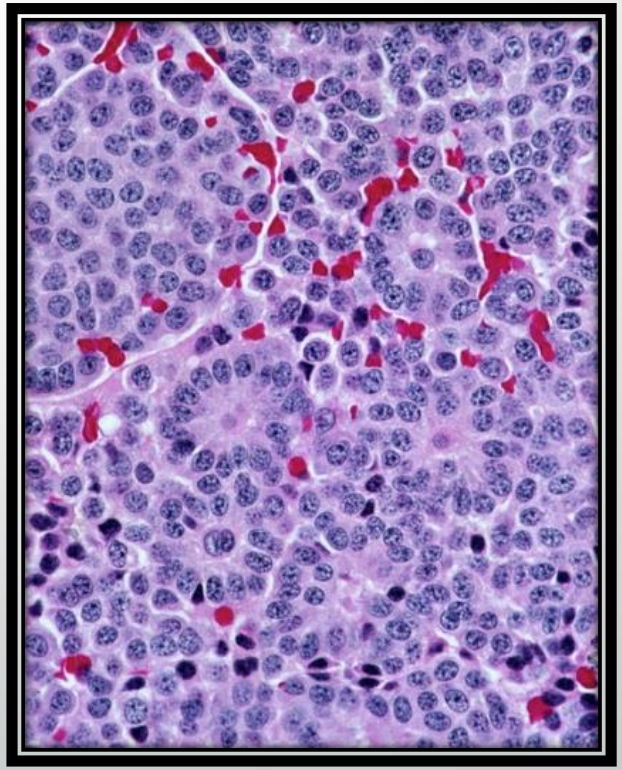
Catecholamine Excess

- Pheochromocytoma- rare tumor secreting catecholamines
  - Look for metabolites
    - fractionated metanephrines and catecholmaines is best
    - VMA less good



Serotonin Excess

- Carcinoid tumor- abdominal neuroendocrine
  - Overproduction of serotonin
  - Degrades into 5-HIAA
    - Detection in 24 hour urine



GI Hormones

- Gastrin- secreted to stimulate gastric secretion (acid)
  - Zöllinger-Ellison Syndrome
    - Pancreatic secretion, excess
- Pancreatic function- not testing as much as USING to test
  - Secretin- stimulates alkaline secretions in response to acids
  - Choleocystokinin- stimulates enzymes release in response to amino acids, lipids
  - We can intentionally administer these to see effects, test for pancreatic exocrine function