REGULATION OF KIDNEY FUNCTION

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BALANCE: FLUID, ELECTROLYTE, pH regulated especially by the kidneys. P 1018
- fluid distributed between: extracellular (ECF) and intracellular fluid (ICF)
- electrolytes notably Na⁺ (variation relatively benign) and K⁺ (98% ICF) variation can be pathological
- pH should be 7.35-7.45 (below 7.0 deadly). Raise pH: Kidneys pump out H⁺, Lungs pump out CO₂

CONTROL OF BLOOD VOLUME: increase blood volume by retaining Na (aldosterone), and water (ADH)

ALDOSTERONE (and other corticosteroids) important regulator of blood volume and urine volume
Aldosterone synthesis is regulated by renin-angiotensin-aldosterone axis (or system): (page 1026)
- low blood vol or pressure (and sympathetic stim) cause:
  - juxtaglomerular complex to release renin. (P 981)
  - angiotensinogen (plasma protein fr liver) activated by renin,
  - angiotensin I relatively inactive
  - Angiotensin converting enzyme (ACE) in the lungs converts angiotensin I to:
  - angiotensin II: (most active)
Angiotensin II has four stimulatory effects:
1) aldosterone secretion from zona glomerulosa (Aldosterone stimulates synthesis of Na/K pump protein in distal convoluted tubules and collecting ducts.)
2) anti-diuretic hormone release
3) increases thirst
4) cardiac output, arteriole constriction

ACE inhibitors lower blood pressure by blocking activation of angiotensin.

ANTI-DIURETIC HORMONE released from neurohypophysis
1) increases permeability of collecting tubules
2) stimulates thirst centers
release stimulated by: hypothalamic osmoreceptors in which detect
1) High solute concentration in extracellular fluid (electrolytes)
2) low BP
3) angiotensin II
release inhibited by: high blood pressure detected by baroreceptors in L atrium

MECHANISMS OF DIURETIC CHEMICALS:
- Adrenaline inhibit ADH production/release
- Alcohol inhibit ADH production/release.
- Caffeine dilates afferent arterioles, increases glomerular filtration
- Diabetes insipidus lacks ADH.