

# REGULATION OF KIDNEY FUNCTION

revised 12 April 2016

Jacob et al, p. 530-532, S&M II, p 444 and 513, Martini 1028-1053, 6<sup>th</sup>: , 7<sup>th</sup>: 622, 731, 977, 1003, 8<sup>th</sup>: 1010-1037, 9<sup>th</sup>: 978-994, 10<sup>th</sup>: 1016-1047

**BALANCE: FLUID, ELECTROLYTE, pH** regulated especially by the kidneys. P 1018

**fluid** distributed between: extracellular (ECF) and intracellular fluid (ICF)

**electrolytes** notably  $\text{Na}^+$  (variation relatively benign) and  $\text{K}^+$  (98% ICF) variation can be pathological)

**pH** should be 7.35-7.45 (below 7.0 deadly). Raise pH: Kidneys pump out  $\text{H}^+$ , Lungs pump out  $\text{CO}_2$

**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

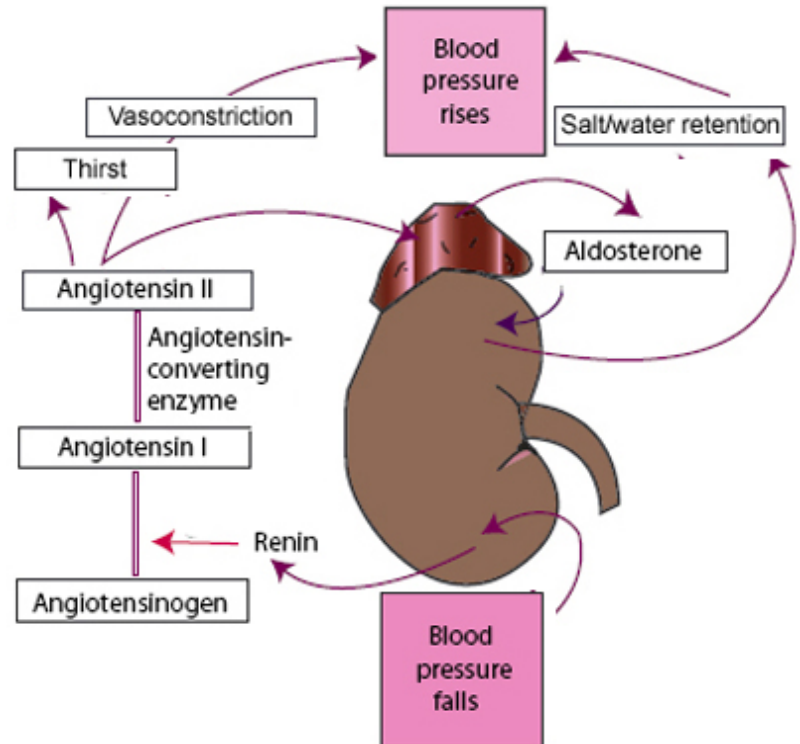
**Angiotensin converting enzyme (ACE) in the lungs** converts angiotensin I to:

**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) **antidiuretic 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.

