

REGULATION OF KIDNEY FUNCTION

Jacob et al, p. 530-532, S&M II, p 444 and 513, Martini 1028-1053, 6th: , 7th: 622, 731, 977, 1003, 8th: 1010-1037
rvsd 14 May 98, 11 May 00, 5 May 03, 14 May 08, 12May10

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

p 1011 **fluid** distributed between: extracellular (ECF) and intracellular fluid (ICF)

p 1013 **electrolytes** notably Na^+ (variation relatively benign) and K^+ (98% ICF) variation can be pathological)

p 1029 **pH** should be 7.35-7.45 (below 7.0 deadly). Raise pH: Kidneys pump out H^+ , Lungs pump out 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 636)

low blood vol or pressure (and sympathetic stim)

cause:

juxtaglomerular complex to release **renin**.

angiotensinogen (plasma protein fr liver)

activated by renin,

relatively inactive

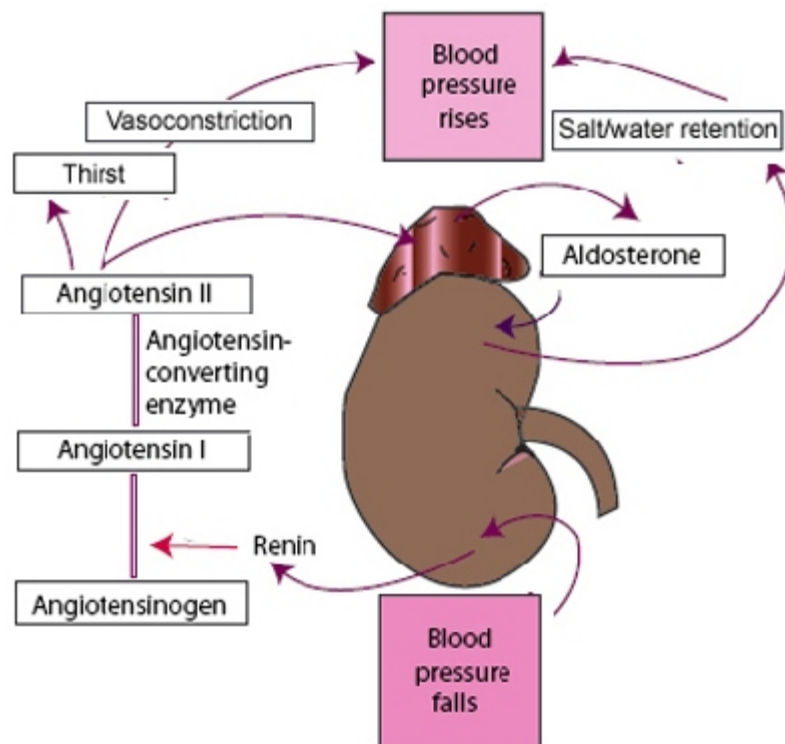
angiotensin I

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

angiotensin II: (P 731) (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** (p 992, 1018)

- 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.

