

HUMAN ANATOMY & PHYSIOLOGY-II- BP201T

UNIT: 3

CLASS: 9

TOPIC: RAS IN KIDNEY**ROLE OF RENIN ANGIOTENSIN SYSTEM (RAS) IN KIDNEYS:**

The RENIN-ANGIOTENSIN-ALDOSTERONE SYSTEM (RAAS) is essentially required for the regulation of cardiac output and arterial pressure. Renin is a proteolytic enzyme released by the kidney into the blood circulation -facilitate angiotensin to be formed in the blood and tissue, Which further facilitates aldosterone to be released from the adrenal cortex

STIMULATION OF RENIN RELEASE:

Increased sympathetic / Decreased Pressure/ Decreased Na⁺ Delivery to Distal tubule



Renin is released from the juxtaglomerular (JG) cells linked with the afferent arteriols of the renal glomerulus



Released renin enters in the blood circulation



Converts the Angiotensinogen in to Angiotensin- I



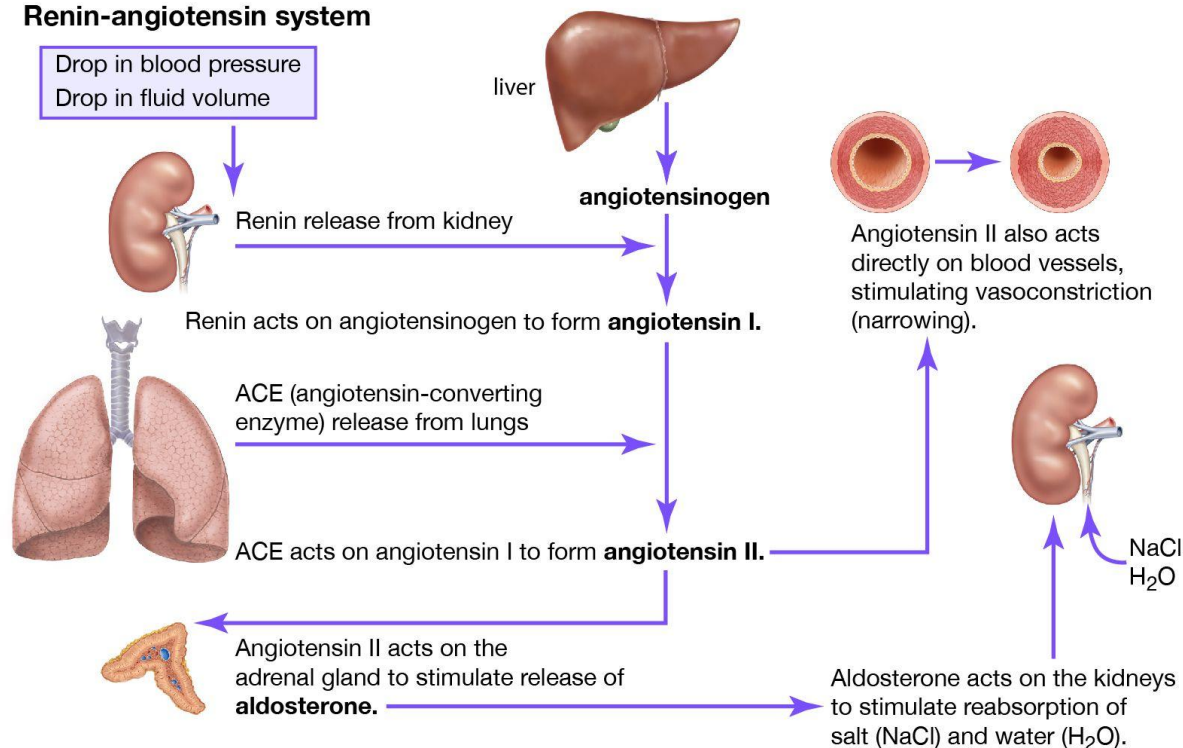
Angiotensin- I is converted in to Angiotensin –II by ACE (Angiotensin Converting Enzyme)



It increases arteriole pressure by constricting blood vessels. It increases the sodium and water retention in the body by stimulating sodium reabsorption at various sites on a renal tubule. It stimulates the release of aldosterone from the adrenal cortex, which in turn acts on the kidneys to

aid sodium and fluid retention. It stimulates the release of anti-diuretic hormone from the posterior pituitary gland to increase the fluid retention by the kidneys. It stimulates the thirst centres in the brain

Renin-angiotensin system

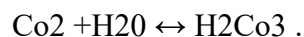


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ROLE OF KIDNEYS IN ACID-BASE BALANCE

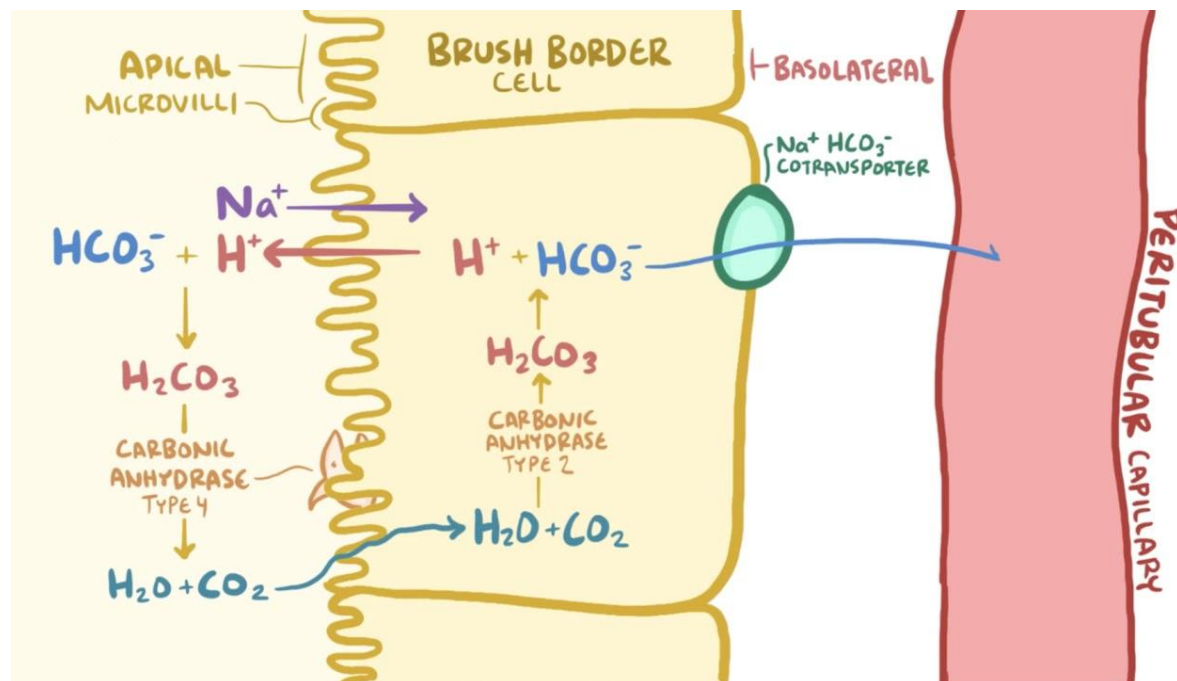
An acid donates protons, while base accepts it. Physiologically, acids are categorized into two important groups:

Carbonic or Volatile Acid: It is derived from aldehyde (CHO) and fat metabolism It producing 15,000 mmol of Co₂ per day.



Carbonic acid metabolism is regulated by respiration.

Non-Carbonic or Non-Volatile Acid; It is derived from the protein metabolism, It producing 1.0-1.5 mmol of H^+ per day per Kg. The released H^+ is captured in the form of H_2SO_4 , H_2PO_4 , etc, It is excreted by the kidney



TYPES OF ACID-BASE BALANCE:

Acid-Base Balance divided into :

1) Normal Acid-Base balance: i) normal plasma pH= 7.4 (Range: 7.35-7.45)



2) Abnormal Acid-Base Balance: An imbalance in Acid-Base is termed as acidosis or alkalosis i) acidosis is an increased state of H^+ ions ii) Acidemia occurs when blood pH becomes less than 7.35 iii) Alkalosis is an increased state of HCO_3^- ions . iv) Alkalemia occurs when blood pH becomes greater than 7.45 Acid-Base disturbance is termed as a metabolic disorder

FACTORS AFFECTING ACID-BASE BALANCE PROCESSES: Increase acid load, Volume contraction,, Increased pCO_2 , Decreased intracellular K^+ , Increase Aldosterone

The final urine should not contain any HCO_3^- ions. Urine pH is less than 5.8 is an indication of being free from HCO_3^- ions.

REGULATION OF ACID-BASE BALANCE

Acid-base balance should be regulated by the following ways. i) chemical buffering by intracellular and extracellular buffers ii) control of $p\text{CO}_2$ by normal respiratory functions, and iii) Control of HCO_3^- ions concentration and acid excretion by the kidneys

DISORDERS OF KIDNEY

The following disorders of kidney are discussed below:

- 1) Renal calculi (kidney stones) – accumulation of calcium oxalate in inner lining of kidney
- 2) Urinary tract infections – Bacteria – E.coli - Enters through urethra – affect any part of urinary system
- 3) Glomerulonephritis – due to change in the body immune system – affect glomerulus
- 4) Diabetic nephropathy – in diabetic patients – kidney fails to remove waste products & excessive fluids from body
- 5) Renal failure - kidney permanently fails to function
- 6) Polycystic Kidney Disease(PKD) – genetic disease – formation of cluster of cyst
- 7) Nephroblastoma (Wilm's tumour) – cancer disease in kidney
- 8) Hydronephrosis – Inflammation of kidney
- 9) Urithritis - Inflammation and Irritation in urethra
- 10) Urinary Bladder cancer – cancer in the bladder