

\*\*H<sup>+</sup>/HCO<sub>3</sub><sup>-</sup> دائما في بينهم توازن

\*\*PH of blood is 7.4

ما الها رينج  
يعني أي تغير يؤدي الى خلل

\*\*volatile acids(carbonic acid) يخرج اثناء  
التنفس  
لا يخرج اثناء التنفس

\*\*rapid mechanism :during the event

\*\*Intermediate mechanism :respiratory buffer

\*\*slow mechanism : in kidney/long acting/after event

\*\*the kidney starts full correction:

- اذا في ايونات هيدروجين زيادة تخرج في البول
- اذا كان في قلوبات زيادة يحدث:

HCO<sub>3</sub><sup>-</sup> reabsorbtion

\*\*\*Alkalosis: increase in Hco<sub>3</sub><sup>-</sup> or decrease in H<sup>+</sup>

\*\*Ammonia: doesn't affect on the PH of urine.

كل ما يخرج ايونات هيدروجين في البول بصير  $\text{--PH} = \frac{\text{H}^+}{\text{HCO}_3^-} = 7.4$  اعادة امتصاص ل  
للدم  $\text{HCO}_3^-$

\*\*أحيانا يخرج ال

$\text{HCO}_3^-$

DIFFUSION. لحالة ال

\*\*أحيانا يدخل ال

$\text{HCO}_3^-$  ,

ويخرج  $\text{CL}^-$

(COUNTER ANTI PORT)

يعني الجسم يخرج جزيء ويدخل جزيء سالب

مشكلة في التنفس: Respiratory acidosis

1) Pulmonary fibrosis: increasing in the thickness of the wall of alveoli

\*\*all of diseases of acidosis lead to accumulation of  $\text{CO}_2$  in the blood and increase in acidity.

\*Alkalosis: increase in HCO<sub>3</sub><sup>-</sup> and decrease in H<sup>+</sup>

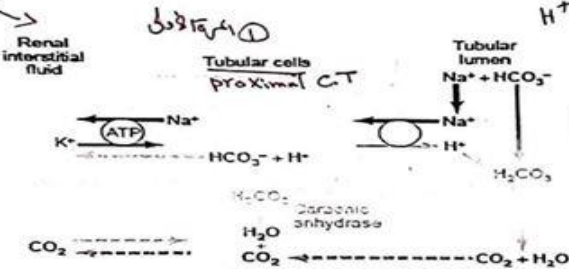


In case of severe vomiting specially (Rotavirus) It also leads to gastritis because of HCL decreasing.

Carbonic anhydrase → H<sub>2</sub>O + CO<sub>2</sub>   
 هذا التفاعل يحصل مرتين  
 ويرتبط مع H<sub>2</sub>CO<sub>3</sub> إلى H<sup>+</sup> + HCO<sub>3</sub><sup>-</sup>

- 2-In the proximal tubule:
- a- H<sup>+</sup> is secreted from the cells into the lumen in exchange with filtered Na<sup>+</sup> using Na<sup>+</sup> - H<sup>+</sup> antiport protein
  - b- The secreted H<sup>+</sup> combine with filtered HCO<sub>3</sub><sup>-</sup> forming H<sub>2</sub>CO<sub>3</sub> that dissociates in the lumen into CO<sub>2</sub> + H<sub>2</sub>O.
  - c- CO<sub>2</sub> diffuse to the tubular cells and combine with H<sub>2</sub>O to form H<sub>2</sub>CO<sub>3</sub> that dissociate into H<sup>+</sup> and HCO<sub>3</sub><sup>-</sup>.
  - d- The HCO<sub>3</sub><sup>-</sup> in the tubular cell is transported out of the cell on basolateral side by HCO<sub>3</sub><sup>-</sup> - Na<sup>+</sup> symport protein.

Net result.  
 Filtered Na<sup>+</sup> and HCO<sub>3</sub><sup>-</sup> are reabsorbed  
 H<sup>+</sup> is secreted.



اعرة انتفاع في ال Filtration

عندما مستوى الجسم على اقصاه كثيرة عدد تتفاعل  
 $H^+ + HCO_3^- \rightarrow H_2CO_3$   
 H<sub>2</sub>O + CO<sub>2</sub> → H<sub>2</sub>CO<sub>3</sub>  
 Na<sup>+</sup>-H<sup>+</sup> counter transport  
 Na<sup>+</sup> ← H<sup>+</sup> ← HCO<sub>3</sub><sup>-</sup>

توازن في  
 H<sub>2</sub>O + CO<sub>2</sub> → H<sub>2</sub>CO<sub>3</sub>  
 H<sub>2</sub>O  
 CO<sub>2</sub> ← H<sub>2</sub>CO<sub>3</sub> → H<sup>+</sup> + HCO<sub>3</sub><sup>-</sup>

Figure (23): H<sup>+</sup> secretion and HCO<sub>3</sub><sup>-</sup> reabsorption in PCT.

3-In distal tubule:  
 The distal nephron ( distal tubule and collecting duct) plays a significant role in fine regulation of acid - base balance. It contains two types of intercalated cells.

In acidosis, type (A) intercalated cells secrete H<sup>+</sup> and reabsorb bicarbonate. In alkalosis type (B) intercalated cells secrete HCO<sub>3</sub><sup>-</sup> and reabsorb H<sup>+</sup>. Intercalated cells are characterized by high concentration of carbonic anhydrase in their cytoplasm, this enzyme allows them to convert large amounts of CO<sub>2</sub> into H<sup>+</sup> and HCO<sub>3</sub><sup>-</sup>.

sever acidosis  
 H<sup>+</sup> (كثيرة في الدم)  
 وصولان H<sup>+</sup> إلى distal C.T  
 إلى (A-cell) عندها  
 خلاية البول حيث يفرج H<sup>+</sup>-pump  
 ATP  
 against electrochemical gradient

Alkalosis  
 H<sup>+</sup>-pump  
 basal lateral border  
 H<sub>2</sub>O  
 حلال