



AL-Mustaqbal University College

**Medical laboratory Techniques
Department**

Clinical Biochemistry

**Lecture One (1)
(Acid Base Balance)**



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1- Acid-Base Basics

1. Balance depends on regulation of free hydrogen ions
2. Concentration of hydrogen ions is measured in pH.
3. Arterial blood gases are the major diagnostic tool for evaluating acid-base balance

2- Arterial Blood Gases

- | | |
|----------------------|--------------|
| 1. pH | 7.35 - 7.45 |
| 2. PaCO ₂ | 35 - 45 mmHg |
| 3. HCO ₃ | 22-26 mEq/L |

3- Acid-base balance

The blood needs the right balance of acidic and basic (alkaline) compounds to function properly. kidneys and lungs work to maintain the acid-base balance. Even slight variations from the normal range can have significant effects on vital organs.

Acid and alkaline levels are measured on a pH scale. An increase in acidity causes pH levels to fall. An increase in alkaline causes pH levels to rise.

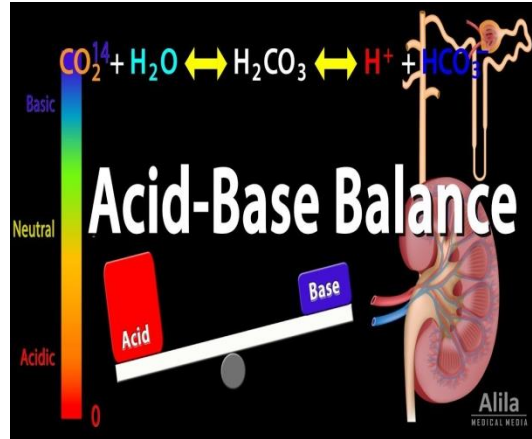
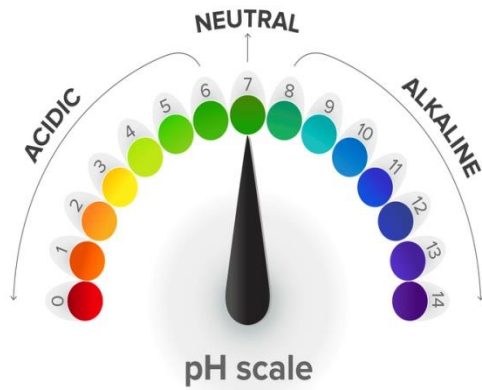


Fig1 A pH scale

When the levels of acid in blood are too high, it's called **acidosis**. When your blood is too alkaline, it is called **alkalosis**.

- ✚ Respiratory acidosis and alkalosis are due to a problem with the **lungs**.
- ✚ Metabolic acidosis and alkalosis are due to a problem with the **kidneys**.

4- Respiratory acidosis

When you breathe, the lungs remove excess carbon dioxide from the body. When they cannot do so, the blood and other fluids become too acidic.

5- Symptoms of respiratory acidosis

Symptoms may include fatigue, shortness of breath, and confusion.

6- Causes of respiratory acidosis

There are several different causes of respiratory acidosis including:

- Chronic lung and airway diseases
- Using the more of sedatives
- Obesity

7- Types of respiratory acidosis

There are no noticeable symptoms of **chronic respiratory acidosis**. This is due to the fact that your blood slowly becomes acidic and your kidneys adjust to compensate, returning your blood to a normal pH balance.

Acute respiratory acidosis comes on suddenly, leaving the kidneys no time to adjust. Those with chronic respiratory acidosis may experience acute respiratory acidosis due to another illness that causes the condition to worsen.

8- Diagnosis of respiratory acidosis

A complete physical examination is necessary. Diagnostic testing may include:

- arterial blood gas test
- metabolic panel
- pulmonary function test
- chest X-ray

9- Preventing respiratory acidosis

You can take steps to help prevent some of the conditions that lead to respiratory acidosis. :-

- Maintain a healthy weight.
- Take sedatives only under strict doctor .
- Do not smoke.

10- Metabolic acidosis

Metabolic acidosis occurs either when the body produces too much acid, or when the kidneys are unable to remove it properly.

11- Causes of metabolic acidosis

- prolonged exercise
- lack of oxygen
- certain medications, including salicylates
- low blood sugar, or hypoglycemia

- alcohol
- seizures
- liver failure
- cancer
- kidney disease
- severe dehydration

12- Diagnosing metabolic acidosis

Diagnostic testing may include serum electrolytes, urine pH, and arterial blood gases. Once acidosis is confirmed, other tests may be necessary to pinpoint the cause.

13- Alkalosis

Alkalosis is when alkaline levels are too high due to decreased carbon dioxide or increased bicarbonate. There are five kinds of alkalosis.

14- Symptoms of alkalosis

Symptoms of alkalosis may include:

- muscle twitching, hand tremor, muscle spasms
- numbness and tingling
- nausea
- vomiting

15- Causes and types of alkalosis

Respiratory alkalosis is when your blood has low levels of carbon dioxide. This can be caused by a number of factors, including:

- lack of oxygen
- high altitude
- fever
- lung disease
- liver disease

16- Diagnosing alkalosis

Along with a physical exam, diagnostic testing for alkalosis may include a metabolic panel, blood gas analysis, urinalysis, and urine pH.

17- metabolic alkalosis

Metabolic alkalosis is a condition that occurs when your blood becomes overly alkaline. Alkaline is the opposite of acidic.

18- Symptoms of metabolic alkalosis

Metabolic alkalosis may not show any symptoms. People with this type of alkalosis more often complain of the underlying conditions that are causing it. These can include:

- vomiting
- diarrhea
- fatigue