3.1: Terminology of Acid-Base Disorders

3.1.1: Definitions

The definitions of the terms used here to describe acid-base disorders are those suggested by the Ad-Hoc Committee of the New York Academy of Sciences in 1965. Though this is over 35 years ago, the definitions and discussion remain valid today.

Basic Definitions

- **Acidosis** - an abnormal process or condition which would lower arterial pH if there were no secondary changes in response to the primary aetiological factor.

- **Alkalosis** - an abnormal process or condition which would raise arterial pH if there were no secondary changes in response to the primary aetiological factor.

- **Simple (Acid-Base) Disorders** are those in which there is a single primary aetiological acid-base disorder.

- **Mixed (acid-Base) Disorders** are those in which two or more primary aetiological disorders are present simultaneously.

  - **Acidaemia** - \( \text{Arterial} \ \text{pH} < 7.36 \ \text{ie} \ [H^+] > 44\text{nM} \)
  
  - **Alkalaemia** - \( \text{Arterial} \ \text{pH} > 7.44 \ \text{ie} \ [H^+] < 36\text{nM} \)

The meaning of the terms acid, base, \([H^+]\) and pH has been discussed previously in Sections 1.2 and 1.3.

An acidaemia of course must be due to an acidosis so is an indicator of the presence of this disorder. In mixed acid-base disorders, there may be co-existing disorders each having opposite effects on the ECF pH so a quick check of the arterial pH is insufficient to fully indicate all primary acid-base disorders. In mixed disorders, it does indicate in general...
terms the most severe disorder. That is, if the arterial pH is 7.2 (an acidaemia), there must be an acidosis present, and any alkalosis present must be of lesser magnitude. (This idea is the basis of an initial step in the systematic approach to analysis of arterial blood gas results).

The Disorders

The 4 simple acid-base disorders are:

- **Respiratory acidosis**
- **Respiratory alkalosis**
- **Metabolic acidosis**
- **Metabolic alkalosis**.

Respiratory disorders are caused by abnormal processes which tend to alter pH because of a primary change in pCO$_2$ levels.

Metabolic disorders are caused by abnormal processes which tend to alter pH because of a primary change in [HCO$_3^-$].

3.1.2: Correct Terminology for Compensatory Responses

Secondary or compensatory responses should NOT be designated as acidosis or alkalosis.

The committee recommended the use of the adjectives secondary or compensatory to describe the change in the composition of the blood or the process (eg ventilation) but not to modify the nouns acidosis or alkalosis. This is the practice adopted here.

Many published articles refer to compensatory processes as though they were primary processes. This lazy and incorrect use of these terms is extremely confusing so caution must be exercised and ultimately one should not be too pedantic in insisting on correct terminology in others as the practice is widespread in the clinical literature.

For example: A patient with diabetic ketoacidosis and compensatory Kussmaul respirations should be described as having a 'metabolic acidosis with compensatory hyperventilation'.

The use of the term secondary respiratory alkalosis in this case would be wrong as the change is a compensatory one and not a primary process and so by definition then it cannot be an alkalosis.

It is possible that a patient such as this could have a mixed disorder with a respiratory acid-base disorder as well as the metabolic acidosis. The interpretation of these more complicated cases is discussed in Section 8.4.

The terms acidaemia and alkalaemia may be used to describe the net pH deviation in the blood but the Ad-Hoc Committee recommended the reporting of the actual pH value or the use of the terms low, high and normal as preferable.
3.1.3: Disorders are defined by their ECF Effects

The clinical acid-base disorders are defined by their effects in the extracellular fluid (or more specifically, in the arterial blood).

The disorder may arise because of changes intracellularly (eg excess lactate production) but the effect extracellularly is what is able to be easily measured.

Despite the definitions of acidosis and alkalosis above, it is common to speak of an 'intracellular acidosis' or an 'intracellular alkalosis'. This use is not consistent with the definitions above but as there are no other satisfactory terms available so this common practice is followed here.

References