

The diagnosis of acid-base disorders follows a stepwise approach (**Table 55-3**). Blood for electrolytes and arterial blood gases should be drawn simultaneously, prior to therapy. An increase in $[\text{HCO}_3^-]$ occurs with either metabolic alkalosis or respiratory acidosis. Conversely, a decrease in $[\text{HCO}_3^-]$ occurs with either metabolic acidosis or respiratory alkalosis. In the determination of arterial blood gases by the clinical laboratory, both pH and Paco_2 are measured, and the $[\text{HCO}_3^-]$ is calculated from the Henderson-Hasselbalch equation. This *calculated* value should be compared with the *measured* $[\text{HCO}_3^-]$ (or total CO_2) on the electrolyte panel. These two values should agree within 2 mmol/L. If they do not, the values may not have been drawn simultaneously, or a laboratory error may be present. After verifying the blood acid-base values, the precise acid-base disorder can then be classified.

TABLE 55-3 Steps in Acid-Base Diagnosis

1. Obtain arterial blood gas (ABG) and electrolytes simultaneously.
2. Compare $[\text{HCO}_3^-]$ on ABG and electrolytes to verify accuracy.
3. Evaluate anion gap (AG); if not normal, correct to albumin concentration of 4.5 g/dL (see text).
4. Know four causes of high-AG acidosis (ketoacidosis, lactic acid acidosis, renal failure, and toxins).
5. Know two causes of hyperchloremic or nongap acidosis (bicarbonate loss from gastrointestinal tract, renal tubular acidosis).
6. Estimate compensatory response (Table 55-1).
7. Compare ΔAG and ΔHCO_3^- .
8. Compare change in $[\text{Cl}^-]$ with change in $[\text{Na}^+]$.

EVALUATE THE ANION GAP

Evaluations of acid-base disorders should involve acknowledgement of the AG. The AG is calculated, either by the clinical laboratory or the clinician, as follows: $\text{AG} = \text{Na}^+ - (\text{Cl}^- + \text{HCO}_3^-)$. The value for plasma $[\text{K}^+]$ is typically omitted from the calculation of the AG in the United States. The “normal” value for the AG reported by clinical laboratories has declined with