Blood Gas Analysis

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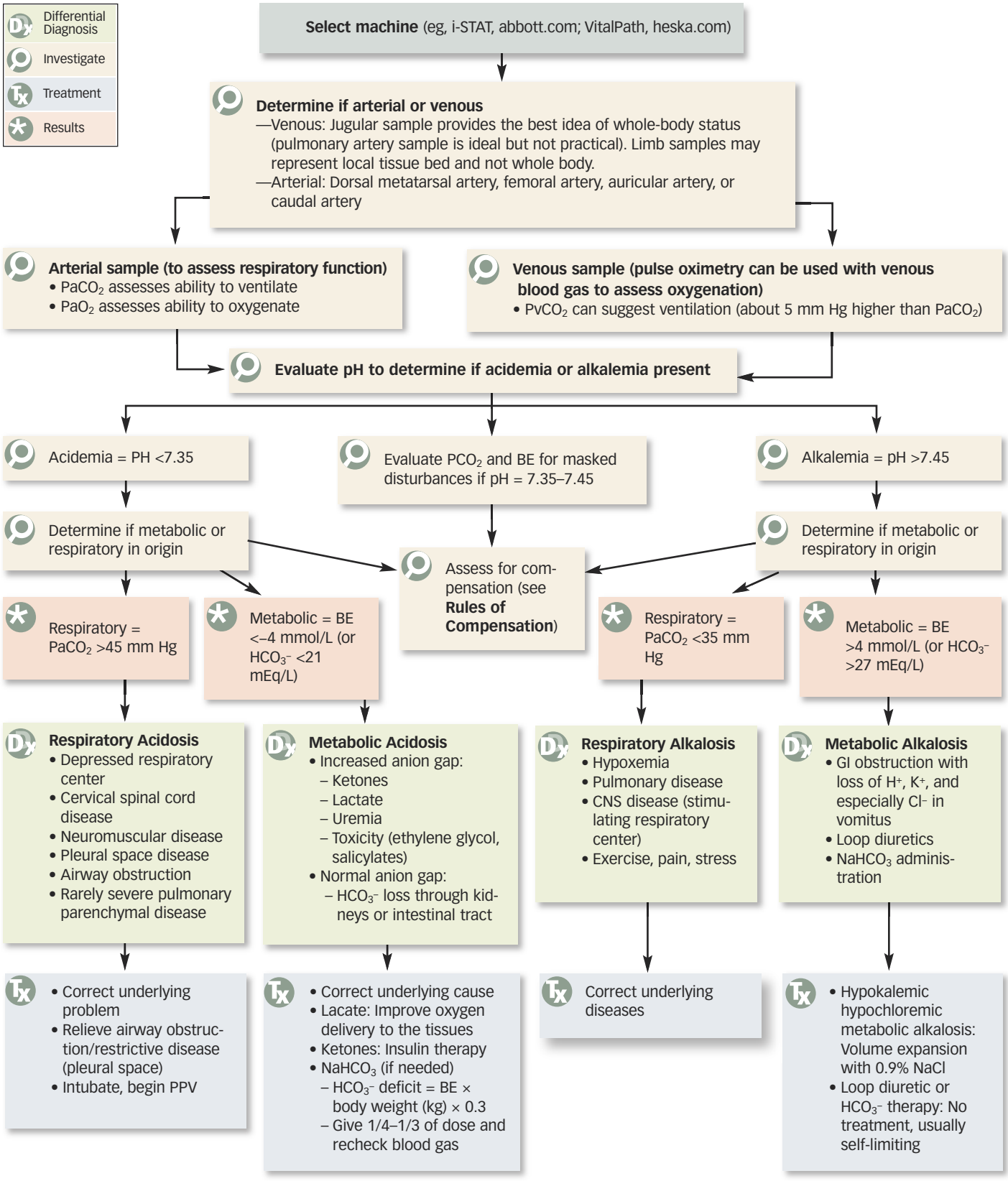

This algorithm reflects canine normals. For cats, substitute feline normals for pH, BE (or HCO_3^-), PCO_2, and PO_2 values (Table 1).

Rules of Compensation

1. Change in respiratory or metabolic component of the acid-base status will normally induce opposite, compensatory change in the other to return the pH toward normal.
2. Lungs compensate rapidly by changing minute ventilation (respiratory rate/tidal volume/both) within minutes.
3. Metabolic compensation occurs via the kidneys and is much slower, starting after a few hours and requiring 4 to 5 days for maximum compensation.
4. Absence or presence and degree of compensation for respiratory disturbance can give an idea of chronicity (**Table 2**).
5. Overcompensation does not occur.
6. If expected compensation is absent, a mixed disturbance is present. For example, if metabolic acidosis is not accompanied by compensatory respiratory alkalosis (the CO_2 is normal or increased), a mixed disturbance is occurring with both metabolic acidosis and respiratory acidosis.

Table 1. Normal Values for Blood Gases

	Arterial	Venous
Canine		
pH	7.35–7.45	7.35–7.45
PO_2 (mm Hg)	90–100	30–42
PCO_2 (mm Hg)	35–45	40–50
HCO_3^- (mEq/L)	20–24	20–24
BE (mmol/L)	–4–+4	–4–+4
Feline		
pH	7.34 ± 0.1	7.30 ± 0.08
PO_2 (mm Hg)	102.9 ± 15	38.6 ± 11
PCO_2 (mm Hg)	33.6 ± 7	41.8 ± 9
HCO_3^- (mEq/L)	17.5 ± 3	19.4 ± 4
BE (mmol/L)	–6.4 ± 5	–5.7 ± 5

Table 2. Expected Compensatory Changes

Disorder	Primary Change	Compensatory Response
Metabolic acidosis	↓ HCO_3^-	0.7 mm Hg decrease in PCO_2 for each 1 mEq/L decrease in HCO_3^-
Metabolic alkalosis	↑ HCO_3^-	0.7 mm Hg increase in PCO_2 for each 1 mEq/L increase in HCO_3^-
Acute respiratory acidosis	↑ PCO_2	1.5 mEq/L increase in HCO_3^- for each 10 mm Hg increase in PCO_2
Chronic respiratory acidosis	↑ PCO_2	3.5 mEq/L increase in HCO_3^- for each 10 mm Hg increase in PCO_2
Acute respiratory alkalosis	↓ PCO_2	2.5 mEq/L decrease in HCO_3^- for each 10 mm Hg decrease in PCO_2
Chronic respiratory alkalosis	↓ PCO_2	5.5 mEq/L decrease in HCO_3^- for each 10 mm Hg decrease in PCO_2

See **Aids & Resources**, back page, for references & suggested reading.

BE = base excess, HCO_3^- = bicarbonate, $NaHCO_3$ = sodium bicarbonate, $PaCO_2$ = partial pressure of arterial carbon dioxide, PCO_2 = partial pressure carbon dioxide, PO_2 = partial pressure oxygen, PPV = positive-pressure ventilation, $PvCO_2$ = partial pressure of venous carbon dioxide