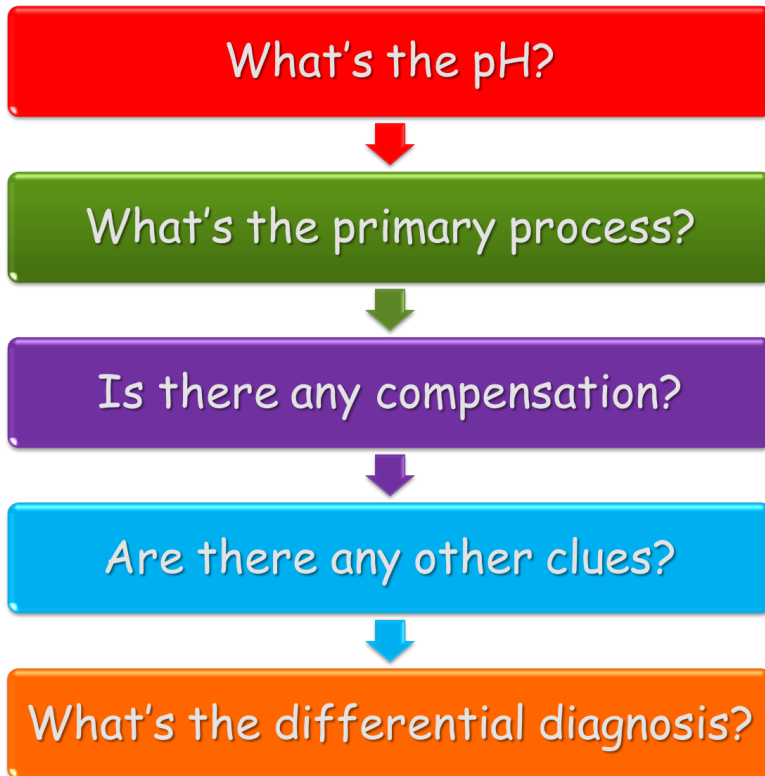


# Blood Gas #2

**History:** A 53-year-old woman is found collapsed at home. Below is her arterial blood gas on arrival:

pH 7.58	Na 138 mmol/L
pCO <sub>2</sub> 12.6 mmHg	K 3.7 mmol/L
pO <sub>2</sub> 160 mmHg (FiO <sub>2</sub> 0.25)	Cl 108 mmol/L
HCO <sub>3</sub> 12.1 mmol/L	Glucose 6.3 mmol/L
Lactate 3.5 mmol/L	

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## What's the pH?

7.58 = alkalaemia

## What's the primary process?

pCO<sub>2</sub> 12.6 = respiratory alkalosis

## Is there any compensation?

**Expected HCO<sub>3</sub> = 24 - 2 x {(40 - Measured pCO<sub>2</sub>)/10}**

= 24 - 2 x {(40 - 12.6)/10}

= 18.5

Measured HCO<sub>3</sub> is lower, therefore there must be a coexisting primary metabolic acidosis.

## Are there any other clues?

**Anion gap = Na - (Cl + HCO<sub>3</sub>)**

$$= 138 - (108 + 12.1)$$

$$= 17.9$$

= high anion gap metabolic acidosis (HAGMA)

$$\text{Delta gap} = (\text{Anion gap} - 12) \div (24 - \text{HCO}_3)$$

$$= (17.9 - 12) \div (24 - 12.1)$$

$$= 0.49$$

This suggests a coexisting HAGMA and NAGMA.

### Electrolyte clues:

Lactate is elevated, other electrolytes are within the normal range.

$$\text{Expected PAO}_2 = (713 \times \text{FiO}_2) - (\text{pCO}_2 \times 1.25)$$

$$= (713 \times 0.25) - (12.6 \times 1.25)$$

$$= 162.5 \text{ mmHg}$$

Measured pO<sub>2</sub> is 160, therefore there is a normal A-a gradient.

## What's the differential diagnosis?

**Description:** This arterial blood gas demonstrates a severe alkalaemia due to a primary respiratory alkalosis, combined with high anion gap and non-anion gap metabolic acidoses. The serum lactate is elevated and there is no A-a gradient. Other electrolytes are within normal limits.

**Interpretation:** In this clinical context, the blood gas is highly suggestive of a salicylate overdose. Elevated lactate will also contribute to the anion gap. Hyperventilation due to pain, anxiety or another central cause should be considered. Salicylate levels should be requested and enhanced elimination commenced where appropriate.

**Additional information:** The patient had taken unknown amounts of aspirin, lithium and olanzapine. Salicylism is normally associated with a high anion gap metabolic acidosis, however many gas machines read salicylate as chloride, giving a falsely elevated chloride and a pseudo-NAGMA.