



METABOLIC ACIDOSIS

NORMAL VALUES

- cH^+ : 35 to 45 nmol/l
- pH: 7.35 to 7.45
- pCO_2 : 35 to 45 mmHg, 4.6 to 6.0 kPa
(To convert pCO_2 in kPa to mmHg, multiply by 7.52.)
(To convert pCO_2 in mmHg to kPa, multiply by 0.133.)

Metabolic acidosis is characterised by **low pH** (high cH^+), **low pCO_2** ($PaCO_2$) and **low bicarbonate** ($[HCO_3^-]$).

ANION GAP

- $[Na^+] + [K^+] - \{[Cl^-] + [HCO_3^-]\} =$ anion gap. Normal value is 10-20mmol/L.
- Higher values suggest an accumulating unmeasured anion – a ketoacid or other organic acid

Normal values are commonly found when there is high $[Cl^-]$, hyperchloraemic acidosis, due to loss of bicarbonate in renal or intestinal disease.

METABOLIC ACIDOSIS, high ion gap

- Sepsis
- Poor tissue perfusion
- Cardiogenic shock
- Coarctation of the aorta / hypoplastic aortic arch
- Bowel ischaemia
- Severe ketosis (starvation)
- Diabetic ketoacidosis
- Organic acidaemias
- Primary lactic acidosis, with very high lactate >10 mmol/L
- Ethanol poisoning, methanol poisoning, ethylene glycol poisoning
- Iron poisoning
- Salicylate poisoning

METABOLIC ACIDOSIS, normal ion gap

- Severe diarrhoea causing bicarbonate loss
- Renal disease causing urine bicarbonate loss
- Renal disease causing failure of acidification of urine

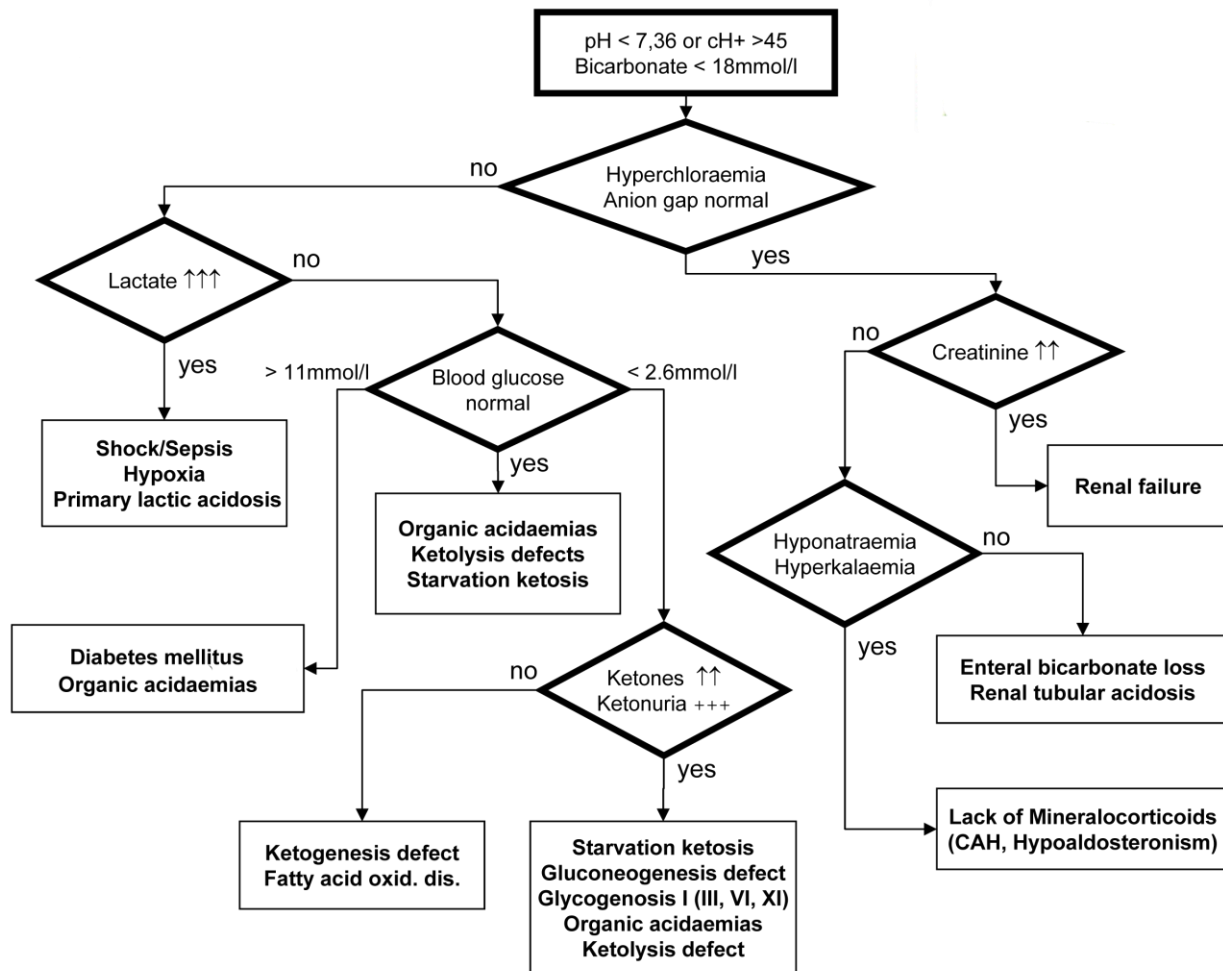
Normal anion gap; urine $[Cl^-] >$ urine $\{[Na^+] + [K^+]\} =$ **extrarenal hyperchloraemic acidosis**

Normal anion gap; urine $\{[Na^+] + [K^+]\} >$ urine $[Cl^-] =$ **renal tubular acidosis**

INVESTIGATIONS

- Capillary or arterial blood gas analysis
- Glucose
- Urea and electrolytes, including chloride and phosphate
- Lactate
- β -hydroxybutyrate
- plasma amino acids
- 2 bloodspots on a “Guthrie” card for acylcarnitine analysis
- Collect the “first pass” urine for test strip analysis of acetoacetate (“ketones”), urine electrolytes and urine pH (with a capillary blood gas for pH at the same time).
- Freeze for later organic acid analysis

DIAGNOSTIC ALGORITHM



METABOLIC ACIDOSIS

Original guideline author: Dr Peter Galloway, Dr Bernd Schwahn, IMD Scotland Protocols Subgroup.
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This guidance is not intended to be construed or to serve as a standard of care. Standards of care are determined on the basis of all clinical data available for an individual case and are subject to change as scientific knowledge and technology advance and patterns of care evolve. Adherence to recommendations will not ensure a successful outcome in every case, nor should they be construed as including all proper methods of care or excluding other acceptable methods of care aimed at the same results. The ultimate judgement must be made by the appropriate healthcare professional(s) responsible for clinical decisions regarding a particular clinical procedure or treatment plan. This judgement should only be arrived at following discussion of the options with the patient, covering the diagnostic and treatment choices available. It is advised, however, that significant departures from national guidance or any local guidelines derived from it should be fully documented in the patient's case notes at the time the relevant decision is taken.