

POTASSIUM BALANCE

1. What is the normal range for serum potassium?

3.5–5.0 mmol⁻¹.

2. What is the distribution of potassium in the body?

About 98% of the body's potassium is intracellular. Thus, the intracellular concentration is ~150 mmol⁻¹ compared to the serum concentration of ~4 mmol⁻¹.

3. Which factors are responsible for the regulation of serum potassium?

- *Dietary intake*: a typical 'Western' diet contains 20–100 mmol of potassium daily
- *Aldosterone*: a steroid hormone of the adrenal cortex. Stimulates absorption of sodium in the DCT of the kidney, and several other organs, at the expense of potassium loss through active exchange at the cell membrane
- *Acid-base balance*: potassium and H⁺ are exchanged at the cell membrane, so that an increase of one ion leads to increased exchange with the other, e.g. acidosis leads to hyperkalaemia and vice versa. Such membrane exchange occurs in the kidney tubules as well as other cells
- *Tubular fluid flow rate*: increased flow leads to potassium loss – this is one way in which diuretics promote hypokalaemia
- *Insulin*: stimulates potassium intake into cells, reducing the serum level

4. Give some causes of hyperkalaemia.

- *Artefact*: e.g. haemolysis in the blood bottle
- *Iatrogenic*: excess external administration
- *Following internal redistribution*:
 - *Between intracellular fluid (ICF) and ECF* due to injury, e.g. crush injury, burns, intravascular haemolysis
 - *Reduced cellular uptake*: diabetes mellitus, acidosis

- *Decreased excretion:*
 - *Renal:* renal failure, potassium-sparing diuretics
 - *Adrenal origin:* Addison's disease
 - *Mineralocorticoid resistance:* systemic lupus erythematosus (SLE), chronic interstitial nephritis

5. Which ECG changes may you see with hyperkalaemia?

- Tall and tented T-waves
- Small P-waves
- Wide QRS complex

6. Give some causes of hypokalaemia.

- *Artefact:* e.g. drip-arm sampling
- *Decreased oral intake*
- *Internal re-distribution:*
 - *Between ECF and ICF:* alkalosis, excess insulin (iatrogenic, insulinoma)
- *Loss from the body:*
 - *GIT losses:* vomiting, diarrhoea, mucin-secreting colonic adenoma, entero-cutaneous fistula
 - *Renal losses:* Conn's syndrome, use of loop and thiazide diuretics

7. Which ECG changes might you see?

- Small or inverted T-waves
- Prolonged PR-interval
- S-T segment depression