1. For replacement of *insensible losses* through sweat, respiration, gastrointestinal loss etc.
2. For replacement of *essential urine output*, the minimal urine output to allow excretion of urea etc.
3. Extra fluid to maintain a *modest state of diuresis*.
4. Fluid to replace *abnormal losses* such as blood loss, severe diarrhoea, diabetic polyuria losses etc.

A formula for calculating normal fluid requirement is given in Table B.1 below. It is useful because it is simple, can be applied to all age ranges and is easily subdivided. The formula gives total fluid requirements, that is, types 1+2+3 above.

**Table B.1.** Normal fluid requirements

| Body weight | Fluid requirement per day | Fluid requirement per hour |
|---|---|---|
| First 10 kg | 100 ml/kg | 4 ml/kg |
| Second 10 kg | 50 ml/kg | 2 ml/kg |
| Subsequent kg | 20 ml/kg | 1 ml/kg |

For example: a 6 kg infant would require 600 ml per day
a 14 kg child would require 1000+200=1200 ml per day
a 25 kg child would require 1000+500+100=1600 ml per day

## Electrolytes

To speak of normal electrolyte requirements is as artificial as speaking of normal fluid requirements. There are obligatory losses of electrolytes in stools, urine, and sweat, and these require replacement. Any excess is simply excreted in the urine. Table B.2 shows the electrolyte content of various body fluids and Table B.3 gives electrolyte "requirements" if there are not excessive losses from any compartment. In truth these "requirements" represent quantities that if given maintain homeostasis without recourse to the various hormonal and renal tubular mechanisms for maintaining the extracellular fluid composition.

**Table B.2.** Electrolyte contents of body fluids

| Fluid | Na (mmol/l) | K (mmol/l) | Cl (mmol/l) | $HCO_3$ (mmol/l) |
|---|---|---|---|---|
| Plasma | 135–141 | 3·5–5·5 | 100–105 | 24–28 |
| Gastric | 20–80 | 5–20 | 100–150 | 0 |
| Intestinal | 100–140 | 5–15 | 90–130 | 15–65 |
| Diarrhoea | 7–96 | 34–150 | 17–164 | 0–75 |
| Sweat | <40 | 6–15 | <40 | 0–10 |

**Table B.3.** Normal water, electrolyte, energy and protein requirements

| Body weight | Water (ml/kg/day) | Sodium (mmol/kg/day) | Potassium (mmol/kg/day) | Energy (kcal/day) | Protein (g/day) |
|---|---|---|---|---|---|
| First 10 kg | 100 | 2–4 | 1·5–2·5 | 110 | 3·00 |
| Second 10 kg | 50 | 1–2 | 0·5–1·5 | 75 | 1·50 |
| Subsequent kg | 20 | 0·5–1 | 0·2–0·7 | 30 | 0·75 |

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| Second 10 kg | 50 | 1–2 | 0·5–1·5 | 75 | 1·50 |
| Subsequent kg | 20 | 0·5–1 | 0·2–0·7 | 30 | 0·75 |