Potassium Chloride Injection, Solution

**Identification**
- Type of solution: Parenteral electrolyte replacement\(^{2,3,4,5,6}\)
- Abbreviation: KCl

**Regulatory Status**
- KCl solution and injection concentrate require a prescription but are not controlled substances\(^{4,5}\)

**Description**
- Contents

<table>
<thead>
<tr>
<th>Na(^+) (mEq/mL)</th>
<th>Cl(^-) (mEq/mL)</th>
<th>K(^+) (mEq/mL)</th>
<th>Ca(^{++}) (mEq/mL)</th>
<th>Glucose (g/L)</th>
<th>Other relevant ingredients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diluent-dependent</td>
<td>Injection concentrate: 2–3(^{4,5})</td>
<td>Injection concentrate: 2–3(^{4,5})</td>
<td>Diluent-dependent</td>
<td>Diluent-dependent</td>
<td></td>
</tr>
</tbody>
</table>

- Calories/L
  - Solution: Diluent-dependent; injection concentrate: 0
- Tonicity
  - Solution: Volume-/diluent-dependent; injection concentrate: Hypertonic (4,000–6,000 mOsmol/L)\(^5\)
- Physical appearance
  - Clear, colorless

**Common Usage/Primary Action**
- KCl is U.S. FDA-approved to treat and prevent hypokalemia in adults\(^{2,3,4,5,6}\)
  - Ready-to-use injection concentrate is indicated only for fluid-restricted patients requiring K\(^+\) replacement and/or maintenance\(^5\)
- Potassium is the primary intracellular cation, and is vital for electrolyte balance and normal tissue metabolism and function. Chloride is the primary anion of extracellular fluid, and regulates body water distribution, fluid/electrolyte balance, and osmotic pressure\(^{2,3,4,5,6}\)

**Associated Laboratory/Diagnostic Tests**
- Monitor serum electrolytes (K\(^+\), Cl\(^-\), Mg\(^{++}\)), fluid/electrolyte balance, acid/base balance, and ECG\(^2,3\)
Continually monitor ECG in patients receiving injection concentrate, and in patients receiving higher doses and/or rapid administration (> 10 mEq/hour in adults; > 0.3–0.5 mEq/kg/hour in children)

**Dosage and Administration**

- **KCl can be added to any standard I.V. fluid (e.g., dextrose/water, normal saline, lactated Ringer’s)**

- **NEVER** add KCl to a hanging I.V. bag/bottle; after adding KCl, invert bag/bottle several times to mix thoroughly

- Dehydrated patients: Administer 1 liter of potassium-free solution before starting KCl therapy

- Injection concentrate must be administered slowly with a calibrated infusion device

  - Administer injection concentrate ≥ 300 mEq/L only through a central line

  - Dosage is based on serum K⁺ levels

  - Adults:
    - Serum K⁺ < 2 mEq/L, with ECG changes and/or muscle paralysis: Use infusion rate ≤ 40 mEq/hour and monitor ECG continuously; maximum 400 mEq/day
    - Serum K⁺ > 2.5 mEq/L: Use solution ≤ 40 mEq/L with infusion rate ≤ 10 mEq/hour; maximum 200 mEq/day

  - Children (off-label): 0.5–1 mEq/kg/hour for 1–2 hours

**Adverse Reactions**

- Common adverse reactions include ECG changes secondary to hyperkalemia, infusion site reactions, nausea, vomiting, abdominal pain, and diarrhea

- Serious and/or potentially **life-threatening** adverse reactions include severe hyperkalemia and associated flaccid paralysis, respiratory impairment, cardiac arrhythmias, bradycardia, cardiac arrest, and death

**Nursing Assessment/Implications**

- Monitor vital signs, I & O, and for signs and symptoms of potassium intoxication and hyperkalemia (e.g., unusual weakness or fatigue, bradycardia, arrhythmias, hypotension, general muscle weakness, flaccid paralysis, respiratory paralysis, dyspnea, confusion)

- KCl is a potent vesicant. Monitor infusion site for signs and symptoms of extravasation and/or infiltration; see Facts and Comparisons eAnswers for details of extravasation management

**Red Flags**

- **Potential Interactions**
  - Eplerenone: **Contraindicated**; ↑ risk for severe hyperkalemia and potentially lethal dysrhythmias
  - Dandelion: **Not recommended**; ↑ risk for hyperkalemia
  - Licorice: **Not recommended**; ↓ potassium effectiveness
  - Angiotensin-converting enzyme inhibitors (ACEIs; e.g., captopril, lisinopril), angiotensin receptor blockers (ARBs; e.g., candesartan, losartan), potassium-sparing diuretics (e.g., aMILoride, spironolactone, triamterene): ↑ risk for hyperkalemia; use cautiously and monitor serum K⁺, particularly in older patients and patients with renal impairment
  - Digoxin: Possible digoxin toxicity secondary to hypokalemia on KCl discontinuation; monitor serum K⁺, acid-base balance, and ECG during coadministration, and discontinue KCl cautiously
  - KCl is incompatible in solution with amphotericin B, dantrolene, diazePAM, diazoxide, dimenhydrINATE, haloperidol, imipenem/cilastin, lansoprazole, meropenem, pentamidine, phenytoin, and sulfamethoxazole/trimethoprime

- **Precautions**
  - KCl is **not recommended** for patients with metabolic acidosis (use an alkalinizing K⁺ salt [e.g., acetate, bicarbonate, gluconate]) or with impaired K⁺ excretion
  - Use cautiously in older patients and in patients with systemic acidosis, adrenal insufficiency, extensive tissue breakdown (e.g., from burns), acute dehydration, cardiac disease, or chronic renal failure
Some KCl concentrates contain aluminum, and prolonged use can cause aluminum toxicity in premature neonates and in patients with renal impairment\(^4\,^5\).

- Initial therapy for hypokalemia with KCl in dextrose/water can worsen hypokalemia by producing transient cellular K\(^+\) uptake secondary to dextrose-induced insulin release\(^2\,^3\).

**Allergy**

- KCl is **contraindicated** in patients with known hypersensitivity to formulation components\(^2\,^3\).

**Contraindications**

- See **Allergy** above
- KCl is also **contraindicated** in patients with hyperkalemia from any cause; or severe renal failure with oliguria, anuria, or azotemia\(^2\,^3\).

**Pregnancy/Lactation**

- Pregnancy: Category C: Insufficient human/animal research; use only if potential benefit outweighs risk\(^2\).
- **Compatible** with breastfeeding; breast milk is high in K\(^+\), with 3–4 times normal plasma K\(^+\) levels\(^4\).

**Name Alert**

- None

**Use in Children**

- Safety and effectiveness have not been established in children; however, dosage recommendations exist\(^3\,^4\).
- Injection concentrate is **not recommended** for children\(^4\).

**Food for Thought**

- Risk for fluid overload is inversely proportional, and risk for solute overload is directly proportional to potassium/chloride concentration\(^4\,^5\).
- Researchers found that I.V. and enteral KCl were equally effective for protocol-driven potassium replenishment in ICU patients. They point out that I.V. KCl administration is considerably riskier than enteral administration, and the enteral route was available for most of the study patients; they suggest that protocols be updated to recommend enteral KCl administration whenever possible\(^1\).

**What to Tell the Patient**

- Instruct the patient to immediately report allergy symptoms; abnormal heartbeat; dyspnea; weakness, confusion, dizziness, or syncope; peripheral numbness or paresthesias; severe nausea/vomiting; severe constipation/abdominal pain; abdominal edema; hematemesis; bloody, black, or tarry stools; or injection site irritation\(^4\).
- Advise the patient to consult the clinician or pharmacist before taking potassium supplements, potassium-containing salt substitutes, other prescription or over-the-counter medications, herbal preparations, or dietary supplements.

**References**