POTASSIUM CHLORIDE, GLUCOSE AND SODIUM CHLORIDE

Potassium Chloride 20mmol (0.15%) in 4% Glucose and 0.18% Sodium Chloride infusion solution, BP

Potassium Chloride 30mmol (0.224%) in 4% Glucose and 0.18% Sodium Chloride infusion solution, BP

Potassium Chloride 20mmol (0.15%) in 5% Glucose and 0.45% Sodium Chloride infusion solution, BP

Potassium Chloride 20mmol (0.15%) in 5% Glucose and 0.9% Sodium Chloride infusion solution, BP

Chemical Structure/Molecular Formulae

The chemical name of glucose is D-(+) glucopyranose. Molecular formulae of glucose, sodium chloride and potassium chloride are C₆H₁₂O₆, NaCl and KCl, respectively.

![Chemical Structure](image)

The molecular weight of Glucose (anhydrous) is 180.2 and CAS number is 50-99-7.

DESCRIPTION

The active ingredients are glucose (anhydrous) and sodium chloride and potassium chloride.

Glucose is a monosaccharide, having physical characteristics as a white or almost white crystalline powder, freely soluble in water, sparingly soluble in ethanol (96%). Sodium chloride and potassium chloride occur as a colourless or white crystal and are freely soluble in water.

Potassium Chloride, Glucose and Sodium Chloride infusion solution is a sterile, non-pyrogenic solution and is for single use in one patient on one occasion only. The solution is sterile, clear, colourless to faintly straw-coloured solution, practically free from visible particles. The concentrations of the active ingredients, dissolved in one litre of Water for
Injections are shown in Table 1 (see PRESENTATION AND STORAGE CONDITIONS). They do not contain an antimicrobial agent or an added buffer and have a pH of 3.5 – 6.5. They can be isotonic or hypertonic as reflected by their osmolarities (calculated) listed in Table 1 (see PRESENTATION AND STORAGE CONDITIONS).

**PHARMACOLOGY**

**Mechanism of Action**

Glucose is readily metabolised into carbon dioxide and water with a release of energy. Thus, administration of a glucose solution either by oral or parenteral route will provide water for body hydration as well as energy. In addition, it may reduce catabolic loss of nitrogen from the body and aid in prevention of depletion of liver glycogen. That is, in the absence of glucose, amino acids undergo deamination followed by oxidation in order to release energy.

Potassium is the major cation of intracellular fluid (160mEq/L of intracellular water) and functions principally in the control of body fluid composition and electrolyte balance. Potassium participates in carbohydrate utilisation, protein synthesis, and is critical in the regulation of nerve conduction and muscle contraction, particularly in the heart.

In contrast, sodium is a major cation of the extracellular fluid and functions principally in the control of water distribution, fluid and electrolyte balance, and osmotic pressure of the body fluids. Sodium is also associated with chloride and bicarbonate in the regulation of acid-base balance. A membrane bound enzyme, sodium-potassium activated ATP-ase (Na/K-ATPase), actively pumps sodium ions out of the cells into extracellular compartments, whilst the potassium ions are pumped into the cells against concentration gradients in order to maintain homeostasis of cell electrolytes.

Chloride, the major extracellular anion, closely follows the physiological disposition of sodium cation in maintenance of acid-base balance, isotonicity and electrodynamic characteristics of the cells. An increase of chloride concentration may result in a decrease of bicarbonate level, which leads to plasma acidosis, as shown by the eletroneutrality of the cells by the following equation.

That is: \[ \text{Na}^+ = \text{Cl}^- + \text{HCO}_3^- + \text{[anion gap]}^- \]

where pH is related to equation: \[ \text{pH} = \text{pK}_\text{HCO}_3^- + \log \left[ \frac{\text{HCO}_3^-}{\text{H}_2\text{CO}_3} \right] \]

The anion gap is called "unmeasured anion".
Pharmacokinetics

As the Potassium Chloride, Glucose and Sodium Chloride infusion solution is directly administered to the systemic circulation by infusion, the bioavailability (absorption) of the active components is complete (100%). After its distribution into extracellular compartments, these ions follow the physiological pathways of the individual ion. That is, potassium ions and sodium ions are pumped into and out of the cells, respectively; by the action of Na/K-ATPase. Sodium and potassium ions are principally excreted by the kidneys.

INDICATIONS

Potassium Chloride, Glucose and Sodium Chloride infusion solution is indicated for replenishing fluid losses, as an energy source and for restoration or maintenance of sodium, potassium and chloride ions in the body fluids. It may be used as a vehicle of drug delivery where intravenous delivery is appropriate and the medicine is compatible with this solution.

CONTRAINDICATIONS

The levels of sodium and potassium ions in Potassium Chloride, Glucose and Sodium Chloride infusion solution are relatively low. Nevertheless it is contraindicated:

- in patients who have known hypersensitivity to the product,
- In patients suffering from conditions in which administration of either sodium chloride or potassium chloride alone is contraindicated,
- In patients with hypernatraemia, hyperchloremia and/or hyperkalaemia that are not related to the concentration effect associated to a volume depletion, severe renal insufficiency (with oliguria/anuria), uncompensated cardiac failure, Addison’s disease and patients who have had a head trauma with 24 hours (with blood glucose concentrations being closely monitored during episodes of intracranial hypertension).

The solution is also contraindicated in patients with uncompensated diabetes, other known glucose intolerances (such as metabolic stress situations), hyperosmolar coma, hyperglycaemia and hyperlactatemia.

Cornstarch is the raw material for the production of glucose. For patients known to have allergy to corn or corn products, this product is contraindicated.
PRECAUTIONS

General

Potassium Chloride, Glucose and Sodium Chloride infusion solutions are available in a Viaflex bag. The safety of the Viaflex plastic bag has been confirmed in tests with animals according to the USP biological tests for plastic containers, as well as by tissue culture toxicity studies. Nevertheless, care should be exercised regarding possible incompatibility outcomes resulted either from the interaction between the plastic container or active ingredients and any added therapeutic substances (if used as a vehicle of drug delivery) (see also DOSAGE AND ADMINISTRATION).

The introduction of additives to any solution, regardless of the type of container, requires special attention to assure that no incompatibilities result. While some incompatibilities are readily observed, one must be aware that subtle physical, chemical and pharmacological incompatibilities can occur. The medical literature, data sheet, the package insert and other available sources of information should be reviewed for thorough understanding of possible incompatibility problems with this product. The product information documents of added medications should be checked prior to use, to ensure compatibility with Potassium Chloride, Glucose and Sodium Chloride infusion solution.

Do not administer Potassium Chloride, Glucose and Sodium Chloride infusion solution unless clear, colourless and free of particles (see DOSAGE AND ADMINISTRATION), and the seals are intact.

Under a dilute condition, osmolarity/L is approximately the same as osmolality/kg. The osmolarity and osmolality values for the Potassium Chloride, Glucose and Sodium Chloride infusion solutions are listed in Table 1 (PRESENTATION AND STORAGE CONDITIONS). Administration of a substantially hypertonic solution may lead to a wide variety of complications, such as crenation (shrinkage) of red blood cells and general cellular dehydration. The infusion of hypotonic fluids together with the non-osmotic secretion of ADH may result in hyponatraemia. Hyponatraemia can lead to headache, nausea, seizures, lethargy, coma, cerebral oedema and death, therefore acute symptomatic hyponatraemic encephalopathy is considered a medical emergency.

Rapid correction of hyponatraemia and hypernatraemia is potentially dangerous (risk of serious neurologic complications).

Administration should be carried out under regular and careful surveillance. Regular monitoring of clinical status, blood glucose level, plasma electrolyte concentrations, plasma creatinine levels, BUN level, acid-base balance and ECG is essential in patients receiving potassium therapy, particularly those with cardiac or renal impairment. Adequate urine flow must be ensured and fluid balance should be monitored.
During long-term treatment, a convenient nutritive supply must be given to the

**Hypersensitivity Reactions**

Hypersensitivity/infusion reactions, including anaphylaxis, have been reported with **Potassium Chloride, Glucose and Sodium Chloride** infusion solution (see **ADVERSE EFFECTS**). Stop the infusion immediately if signs or symptoms of hypersensitivity/infusion reactions develop. Appropriate therapeutic countermeasures must be instituted as clinically indicated.

**Risk of Hyperkalaemia**

Hyperkalaemia is the most common and serious hazard of potassium treatments. Since an exact measurement of potassium deficiency is not usually possible, potassium supplements should be administered slowly and with caution.

**Potassium Chloride, Glucose and Sodium Chloride** infusion solution should be administered with caution, to patients with conditions predisposing to hyperkalaemia and/or associated with increased sensitivity to potassium, such as patients with potassium-aggravated skeletal muscle channelopathies (e.g. hyperkalaemic periodic paralysis, paramyotonia congenital, and potassium-aggravated myotonia/patamyotonia).

Those solutions containing sodium should be used with great care, if at all, in patients with cardiac disease including congestive heart failure, or AV block (especially if they receive digitalis), conditions predisposing to hyperkalaemia such as renal or adrenocortical insufficiency, acute dehydration or extensive tissue destruction as occurs with severe burns.

Sodium salts should be administered with considerable care to patients with hypertension, heart failure, peripheral or pulmonary oedema, impaired renal function, pre-eclampsia or other clinical states in which there exists oedema with sodium retention.

Similarly, caution must be exercised in the administration of these products to patients receiving corticosteroids or corticotropin, as it may lead to sodium and water retention, oedema and hypertension.

The administration of **Potassium Chloride, Glucose and Sodium Chloride** infusion solution can cause fluid and/or solute overloading resulting in dilution of the serum electrolyte concentrations, overhydration, congested states, or pulmonary oedema. The risk of dilution states is inversely proportional to the electrolyte concentrations of the injections. The risk of solute overload causing congested states with peripheral and pulmonary oedema is directly proportional to the electrolyte concentrations of the injections.

**Potassium Chloride, Glucose and Sodium Chloride** infusion solution should be used with care in patients with subclinical diabetes mellitus (see **INTERACTIONS WITH OTHER MEDICINES**), hyperkalaemia, severe renal failure, and in conditions in which potassium retention is present. Careful monitoring of plasma levels is recommended in these clinical situations.
Administration of glucose containing solutions may lead to hyperglycaemia, therefore it is not recommended to use this solution after acute ischemic strokes as hyperglycaemia has been implicated in increasing cerebral ischemic brain damage and impairing recovery. If hyperglycaemia occurs, rate of infusion should be adjusted or insulin administered (see INTERACTIONS WITH OTHER MEDICINES).

**Potassium Chloride, Glucose and Sodium Chloride** infusion solution should be administered with caution to patients who are at risk of experiencing hyperosmolarity, acidosis, or undergoing correction of alkalosis (conditions associated with a shift of potassium from intracellular to extracellular space) and patients treated concurrently or recently with agents or products that can cause hyperkalaemia.

Other groups of patients in whom **Potassium Chloride, Glucose and Sodium Chloride** infusion solution should be used with caution include patients with cardiac arrhythmia. Arrhythmias can develop at any time during hyperkalaemia. Frequently, mild or moderate hyperkalaemia is asymptomatic and may be manifested only by increased serum potassium concentrations and, possibly, characteristic ECG changes.

**Hyponatraemia**

**Potassium Chloride, Glucose and Sodium Chloride** infusion solution should be used with particular caution, in patients with or at risk of hyponatraemia.

The infusion of solutions with sodium concentrations < 0.9% may result in hyponatraemia. Close clinical monitoring may be warranted. Hyponatraemia can lead to headache, nausea, seizures, lethargy, coma, cerebral oedema, and death. Acute symptomatic hyponatraemic encephalopathy is considered a medical emergency.

The risk for hyponatraemia is increased, for example,
- in children
- in elderly patients
- in women
- postoperatively
- in persons with psychogenic polydipsia
- in patients treated with medications that increase the risk of hyponatraemia (such as certain antiepileptic and psychotropic medications).

The risk for developing hyponatraemic encephalopathy is increased, for example,
- in pediatric patients (≤ 16 years of age)
- in women (in particular, premenopausal women)
- in patients with hypoxemia
- in patients with underlying central nervous system disease.
Use in patients at risk of sodium retention, fluid overload and oedema

Potassium Chloride, Glucose and Sodium Chloride infusion solution should be used with particular caution, in patients with or at risk of:
- hypervolemia
- conditions that may cause sodium retention, fluid overload and oedema (central and peripheral)
- medications that may increase the risk of sodium and fluid retention, such as corticosteroids.

Potassium Chloride 20mmol/L 5% Glucose and 0.9% Sodium Chloride infusion solution should be used with particular caution, in patients at risk of the above conditions, hypernatraemia, hyperchloraemia and metabolic acidosis.

Risk of hypo and hyperosmolality, serum electrolytes and water imbalance

Depending on the volume and rate of infusion and depending on a patient’s underlying clinical condition and capability to metabolize glucose, intravenous administration of Potassium Chloride, Glucose and Sodium Chloride infusion solution can cause:
- hypoosmolality
- hyperosmolality, osmotic diuresis and dehydration
- electrolyte disturbances such as
  - hyponatraemia,
  - hypophosphatemia,
  - hypomagnesemia,
- overhydration/hypervolemia and, for example, congested states, including central (e.g. pulmonary congestion) and peripheral oedema.

Potassium Chloride 20mmol/L 5% Glucose and 0.9% Sodium Chloride can also cause:
- acid-base imbalance
- an increase in serum glucose concentration is associated with an increase in serum osmolality. Osmotic diuresis associated with hyperglycaemia can result in or contribute to the development of dehydration and electrolyte losses.

Clinical evaluation and periodic laboratory determinations may be necessary to monitor changes in fluid balance, electrolyte concentrations, and acid-base balance during prolonged parenteral therapy or whenever the condition of the patient or the rate of administration warrants such evaluation.

Risk of Hyperglycaemia

Rapid administration of glucose solutions may produce substantial hyperglycaemia and hyperosmolar syndrome. In order to avoid hyperglycemia the infusion rate should not exceed the patient’s ability to utilize glucose. To reduce the risk of hyperglycaemia-associated complications, the infusion rate must be adjusted and/or insulin administered if blood glucose levels exceed levels considered acceptable for the individual patient.
Intravenous glucose should be administered with caution in patients with, for example:

- impaired glucose tolerance (such as in diabetes mellitus, renal impairment, or in the presence of sepsis, trauma, or shock),
- severe malnutrition (risk of precipitating a refeeding syndrome),
- thiamine deficiency, e.g., in patients with chronic alcoholism (risk of severe lactic acidosis due to impaired oxidative metabolism of pyruvate),
- water and electrolyte disturbances that could be aggravated by increased glucose and/or free water load.

Other groups of patients in whom Potassium Chloride, Glucose and Sodium Chloride infusion solution should be used with caution include:

- patients with ischemic stroke. Hyperglycaemia has been implicated in increasing cerebral ischemic brain damage and impairing recovery after acute ischemic strokes.
- patients with severe traumatic brain injury. Early hyperglycaemia has been associated with poor outcomes in patients with severe traumatic brain injury.
- Newborns.

Prolonged intravenous administration of glucose and associated hyperglycaemia may result in decreased rates of glucose-stimulated insulin secretion.

**Refeeding syndrome**

Refeeding severely undernourished patients may result in the refeeding syndrome that is characterized by the shift of potassium, phosphorus, and magnesium intracellularly as the patient becomes anabolic. Thiamine deficiency and fluid retention may also develop. Careful monitoring and slowly increasing nutrient intake while avoiding overfeeding can prevent these complications.

**Use in patients at risk of severe renal impairment**

Potassium Chloride, Glucose and Sodium Chloride infusion solution should be administered with particular caution, to patients at risk of severe renal impairment. In such patients, administration of Potassium Chloride, Glucose and Sodium Chloride infusion solution may result in sodium retention, fluid overload, and/or may predispose to hyperkalaemia.

**Blood**

Potassium Chloride, Glucose and Sodium Chloride infusion solution should not be administered simultaneously with blood through the same administration set because of the possibility of haemolysis and pseudoagglutination.

**Risk of Air Embolism**

Do not connect flexible plastic containers in series in order to avoid air embolism due to possible residual air contained in the primary container. Pressurising intravenous solutions contained in flexible containers to increase flow rates can result in air embolism if the residual air in the container is not fully evacuated prior to administration. Use of a vented intravenous administration set with the vent in the open position could result in air embolism.
Vented intravenous administration sets with the vent in the open position should not be used with flexible plastic containers.

**Use in Pregnancy**

Category C. Animal reproduction studies have not been conducted with Potassium Chloride, Glucose and Sodium Chloride infusion solution. There have been reports that use in the mother during labor may lead to foetal hyperglycaemia, hyperinsulinaemia and acidosis, with subsequent neonatal hypoglycaemia due to foetal insulin production and jaundice. Given it is not known whether these dosage forms can cause foetal harm when administered to a pregnant woman or can affect reproduction capacity, administration in pregnant women should be based on whether the potential benefits outweigh the risks.

**Use in Lactation**

Safety in lactation has not been established. Use this product in a nursing woman only when it is clearly needed and the potential benefits outweigh the potential risks to the baby.

**Paediatric Use**

Neonates, especially those born premature and with low birth weight, are at increased risk of developing hypo- or hyperglycaemia and therefore need close monitoring during treatment with intravenous glucose solutions to ensure adequate glycaemic control in order to avoid potential long term adverse effects. Hypoglycaemia in the neonate can cause prolonged seizures, coma and brain damage. Hyperglycaemia has been associated with cerebral injury, including intraventricular haemorrhage, late onset bacterial and fungal infection, retinopathy of prematurity, necrotizing enterocolitis, bronchopulmonary dysplasia, increased oxygen requirements, prolonged length of hospital stay, and death.

Infants and children may have an impaired ability to regulate fluid and electrolytes. Fluid replacement therapy should be closely monitored in these populations as fluid and electrolyte disturbances (such as hyponatraemia and hypokalaemia) may occur. Children (including neonates and older children) are at increased risk of developing hyponatraemia as well as developing hyponatraemic encephalopathy. The infusion of hypotonic fluids together with the non-osmotic secretion of ADH may result in hyponatraemia. Severe hyponatraemia can lead to headache, nausea, seizures, lethargy, coma, cerebral oedema, and death; therefore, acute symptomatic hyponatraemic encephalopathy is considered a medical emergency.

Plasma electrolyte concentrations should be closely monitored in the paediatric population. Rapid correction of hyponatraemia is potentially dangerous (risk of serious neurologic complications. Dosage, rate, and duration of administration should be determined by a physician experienced in paediatric intravenous fluid therapy.
Use in the Elderly

When selecting the type of infusion solution and the volume/rate of infusion for geriatric patients, consider that geriatric patients are generally more likely to have cardiac, renal, hepatic, and other diseases or concomitant drug therapy.

Genotoxicity/Carcinogenicity

The active ingredients, glucose, sodium chloride and potassium chloride are neither carcinogenic nor mutagenic. They are the basic constituents in all living cells.

INTERACTIONS WITH OTHER MEDICINES

Potassium Chloride, Glucose and Sodium Chloride infusion solution should not be administered simultaneously with blood preparations through the same administration set, because of the possibility of pseudo-agglutination or haemolysis.

If using this solution as a vehicle of drug delivery, the product information document(s) of the medicine(s) must be reviewed to ensure compatibility with the solution.

Potassium Chloride, Glucose and Sodium Chloride infusion solution should be used with caution in patients treated concurrently or recently with agents or products that can cause hyperkalaemia or increase the risk of hyperkalaemia, such as potassium sparing diuretics. These products should not be administered concomitantly with potassium sparing diuretics (such as amiloride, spironolactone, triamterene), angiotensin converting enzyme (ACE) inhibitors or angiotensin 2 receptor antagonists (A2RAs) as simultaneous administration of these medicines can result in increased risk of severe and potentially fatal hyperkalaemia, in particular in the presence of other risk factors for hyperkalaemia.

Potassium Chloride, Glucose and Sodium Chloride infusion solution should also be used with caution in concomitant cyclosporine, tacrolimus and medicines that contain potassium.

Concurrent use of these products with insulin will decrease serum potassium. Use of these infusions may necessitate review of a patient’s oral hypoglycaemic or insulin requirements, so close monitoring of serum glucose levels is also required.

Both the glycaemic effects of Potassium Chloride, Glucose and Sodium Chloride infusion solutions and its effects on water and electrolyte balance should be taken into account when using these products in patients treated with other substances that affect glycaemic control, or fluid and/or electrolyte balance.

Caution is advised in patients treated with lithium. Renal sodium and lithium clearance may be increased during administration of Potassium Chloride, Glucose and Sodium Chloride infusion solutions and can result in decreased lithium levels.
Regarding medications that increase the risk of hyponatraemia or sodium and fluid retention, see **PRECAUTIONS**.

**Beta-Adrenergic Agents**
Beta adrenoceptor blockade increases both peak serum potassium concentration and the time required for serum potassium to return to basal levels in subjects receiving an acute intravenous potassium load.

**Non-Steroidal Anti-Inflammatory Drugs**
These may cause hyperkalaemia by inducing secondary hypoaldosteronism following inhibition of renal prostaglandin synthesis.

**Heparin**
Heparin reduces the synthesis of aldosterone, which may result in hyperkalaemia, especially in patients with underlying renal insufficiency or other problems that impair potassium excretion.

**Digitalis Glycosides**
Potassium supplementation is not recommended with concurrent digitalis in those patients with severe or complete heart block. Careful monitoring is necessary if potassium chloride is used to correct hypokalaemia in such patients.

**Sodium Bicarbonate**
Concurrent use will decrease serum potassium.

**ADVERSE EFFECTS**

Adverse reactions may occur because of the solution or the technique of administration, including fever response, infection at the site of injection, venous thrombosis or phlebitis extending from the site of injection, extravasation and hypervolemia.

Prolonged administration or rapid infusion of large volumes of glucose-containing solutions may lead to hyperosmolarity, dehydration, hyperglycaemia, hyperglucosuria and osmotic diuresis (due to hyperglycaemia).

If an adverse reaction does occur, discontinue the infusion, evaluate the patient, institute appropriate therapeutic countermeasures and save the remainder of the fluid for examination if deemed necessary.

Retention of excess sodium, when there is defective renal sodium excretion, may result in pulmonary and peripheral oedema. Hyponatraemia has also been reported for similar solutions containing low concentrations of sodium chloride (< 0.9%).

Excessive administration of chloride salts may cause a loss of bicarbonate with an acidifying effect.
An excessive administration of any potassium preparation may result in symptoms of hyperkalaemia. This is particularly manifested in patients with impaired renal function. Infusion of a potassium chloride preparation may also lead to a dangerous level of hyperkalaemia if it is administered at a rate or more than 20mmol/hour. The shift of potassium ions from extracellular fluid into intracellular fluid occurs at a slow rate, therefore, in the interim a rapid infusion may manifest as hyperkalaemia.

Symptoms and signs of potassium intoxication include:

**Cardiovascular**
Fall in blood pressure, cardiac depression, arrhythmias, heart block and cardiac arrest. Hyperkalaemia is usually asymptomatic but may exhibit the following ECG abnormalities: disappearance of the P wave, prolongation of the QT interval, widening and slurring of the QRS complex, changes of the ST segment and tall peaked T waves.

**Gastrointestinal**
Nausea, vomiting and diarrhea may occur.

**Other**
Listlessness, mental confusion, paraesthesia of the extremities, muscle weakness, heaviness of the legs, paralysis.

**Post-marketing**
The following adverse reactions have been reported in the post-marketing experience:
- Immune System Disorders: anaphylactic reaction, hypersensitivity
- Metabolism and Nutrition Disorders: hyponatraemia, hyperglycaemia
- Vascular Disorders: Phlebitis
- Skin and Subcutaneous Tissue Disorders: rash, pruritus
- General Disorders and Administration Site Conditions: Injection site reactions including, infusion site pain, injection site vesicles, chills, pyrexia.

**Other reactions (Class reactions)**
Other adverse reactions reported with other potassium chloride, sodium chloride and glucose intravenous infusions include:
- hyperkalaemia
- cardiac arrest
- hyponatraemia, which may be symptomatic
- hyperchloraemic acidosis

Anaphylactic reactions, hypersensitivity, pyrexia and chills have also been reported for similar solutions containing glucose.
DOSAGE AND ADMINISTRATION

To be used as directed by the physician. The choice of the specific Potassium Chloride, Glucose and Sodium Chloride concentrations, dosage, volume, rate and duration of administration depend on the age, weight and clinical condition of the patient and concomitant therapy as well as laboratory determinations; administration should be determined by a physician.

Hyperosmolar solutions may cause venous irritation and phlebitis. Thus, any hyperosmolar solutions are recommended to be administered through a large central vein, for thorough and rapid dilution of the hyperosmolar solution. See PRESENTATION AND STORAGE CONDITIONS for information on the products’ osmolarity.

Parenteral medicinal products should be inspected visually for particulate matter and discolouration prior to administration whenever solution and container permit (see PRECAUTIONS). Do not administer unless solution is clear and seal is intact. Only sterile and nonpyrogenic equipment must be used for intravenous administration.

A gradual increase of flow rate should be considered when starting administration of glucose-containing products.

Electrolyte supplementation may be indicated according to the clinical needs of the patient.

The Potassium Chloride, Glucose and Sodium Chloride infusion solution filled in Viaflex containers is intended for intravenous administration using sterile equipment.

The equipment should be primed with the solution in order to prevent air embolism due to residual air in the system. Additives may be introduced before infusion or during infusion through the injection site. Additives may be incompatible. Check additive compatibility with both the solution and container prior to use. Complete information is not available. Those additives known to be incompatible should not be used. Consult with a pharmacist, if available.

If in the informed judgment of the physician, it is deemed advisable to introduce additives, use aseptic technique. Mix thoroughly and carefully when additives have been introduced. Do not store solutions containing additives.

The product should be used once only. Any unused portion should be discarded. Do not reconnect partially used bags.

Direction for Use of Viaflex Plastic Container

Do not remove unit from over-wrap until ready for use. The inner bag maintains the sterility of the product. Do not use plastic containers in series connections. Such use could result in embolism due to residual air being drawn from the primary container before
administration of the fluid from the secondary container is completed. Vented intravenous administration sets with the vent open, or pressurising intravenous solutions contained in flexible plastic containers to increase flow rate can result in air embolism if the residual air in the container is not fully evacuated prior to administration.

**To Open**
Tear over wrap down side at slit and remove solution container. Check solution for limpidity and absence of foreign matter. If solution is not clear or contains foreign matter, discard the solution. Some opacity of the plastic due to moisture absorption during the sterilisation process may be observed. This is normal and does not affect the solution quality or safety. The opacity will diminish gradually. Check for minute leaks by squeezing inner bag firmly. If leaks are found, discard solution, as sterility may be impaired.

If supplemental medication is desired, follow directions below.

**Preparation for Administration**
(1) Suspend container from eyelet support.

(2) Remove plastic protector from outlet port at the bottom of container.

(3) Attach administration set; use an aseptic method to set up the infusion.

**To Add Medication**
Additives may be incompatible. Before adding a substance or medication, verify that it is soluble and/or stable in **Potassium Chloride, Glucose and Sodium Chloride** infusion solution and that the pH range is appropriate. Check the product information document(s) of the medication(s), the instructions for use of the medication to be added and other relevant literature must be consulted prior to their addition to **Potassium Chloride, Glucose and Sodium Chloride** infusion solution.

**To Add Medication Before Solution Administration**
Prepare medication site. Using syringe with 19 to 22-gauge needle, puncture resealable medication port and inject. Mix solution and medication thoroughly. For high-density medication such as potassium chloride, squeeze ports while ports are upright and mix thoroughly. After addition, if there is a colour change and/or the appearance of precipitates, insoluble complexes or crystals, do not use.

**To Add Medication During Solution Administration**
Close clamp on the set. Prepare medication site. Using syringe with 19 to 22-gauge needle, puncture resealable medication port and inject. Remove container from IV pole and/or turn to upright position. Evacuate both ports by squeezing them while container is in the upright position. Mix solution and medication thoroughly. Return container to in-use position, re-open the clamp and continue administration. Do not store solutions containing additives.
OVERDOSAGE

Symptoms

There is no overdose experience with Potassium Chloride, Glucose and Sodium Chloride infusion solution preparations. However, excessive administration or impaired excretion of potassium may lead to:

- hyperglycaemia, adverse effects on water and electrolyte balance, and corresponding complications. For example, severe hyperglycaemia and severe dilutional hyponatraemia and their complications, can be fatal,
- hyponatraemia (which can lead to CNS manifestations including seizures, coma, cerebral oedema and death),
- fluid overload (which can lead to central and/or peripheral oedema)
- and the development of potentially fatal hyperkalaemia (see ADVERSE EFFECTS).

Manifestations of hyperkalaemia may include:

- disturbances in cardiac conduction and arrhythmias, including bradycardia, heart block, asystole, ventricular tachycardia, ventricular fibrillation,
- hypotension
- muscle weakness up to and including muscular and respiratory paralysis, paresthesia of extremities
- gastrointestinal symptoms (ileus, nausea, vomiting, abdominal pain)

- arrhythmias and conduction disorders, in addition to arrhythmias and conduction disorders, the ECG shows progressive changes that occur with increasing potassium levels. Possible changes include:
  - peaking of T waves,
  - loss of P waves, and
  - QRS widening.

However, the correlation between potassium levels and ECG changes is not precise, and whether or at which potassium level certain ECG signs develop depends on factors such as patient sensitivity, the presence of other electrolytes disorders, and the rapidity of the development of hyperkalaemia. The presence of any ECG findings that are suspected to be caused by hyperkalaemia should be considered a medical emergency.

When assessing an overdose, any additives in the solution must also be considered. Clinically significant overdose of Potassium Chloride, Glucose and Sodium Chloride infusion solution may, therefore, constitute a medical emergency.

Overdose is usually asymptomatic and may be manifested only by increased serum potassium levels and characteristic ECG features (see ADVERSE EFFECTS and PRECAUTIONS).
Treatment

No specific antidotes to this preparation are known, interventions include discontinuation of Potassium Chloride, Glucose and Sodium Chloride infusion solution administration, dose reduction, administration of insulin and other measures as indicated for the specific clinical constellation.

Should overdose occur, treatment should be discontinued and the patient should be observed for symptoms of the infusion including any additives, with appropriate supportive measures instituted as required. The use of potassium containing foods or medications causing potassium retention must also be discontinued.

Treatment of hyperkalaemia depends on its severity. If hyperkalaemia is present or suspected, discontinue the infusion immediately and institute close ECG, laboratory and other monitoring and, as necessary, corrective therapy to reduce serum potassium levels. It must be kept in mind that rapid lowering of serum potassium concentrations in digitalised patients can cause cardiac toxicity.

Clinically, only the intravascular potassium concentration causes the cardiac disorders. Therefore, infusion of the potassium chloride solution and other exogenous sources of potassium, such as potassium-rich containing foods or medications causing potassium retention (potassium-sparing diuretic) must be discontinued immediately. In patients with severe hyperkalaemia, measures which facilitate the shift of potassium ions from the vascular to the intracellular space, should be initiated. It can be achieved by administration of sodium bicarbonate, glucose/insulin, or calcium gluconate infusions.

In patients with serum potassium concentrations greater than 6.5mmol/L, intravenous infusion of 40 – 160mmol of sodium bicarbonate over a 5 minute period has been recommended. This dose may be repeated every 15 minutes if ECG abnormalities persist. This treatment results in a temporary alkalosis and lowers serum potassium levels by 0.6mmol/L for every 0.1 increase of the pH.

Glucose/insulin infusion is another treatment for an overdose episode with potassium chloride medication. It consists of 300 – 500mL of 10 – 25% Glucose Intravenous Infusion containing 5 – 10IU Insulin per 20g of glucose infused over a 1 hour period.

Patients whose ECGs show the absence of P waves or a broad QRS complex and who are not receiving cardiac glucosides should immediately be given intravenously 0.5 – 1.0g (5 – 10mL of a 10% solution) of calcium gluconate or another calcium salt over a 2 minute period (with continuous ECG monitoring) to antagonize the cardiac toxic effects of potassium. If ECG abnormalities persist, repeated doses of calcium salt may be given, allowing 1 – 2 minutes between doses.

When the ECG approaches normal, efforts should be directed toward removal of excess potassium from the body. This is a choice of treatment, when the removal of the potassium
should be initiated as soon as possible. This is accomplished by administration of sodium polystyrene sulphonate resin orally or rectally, where sodium is exchanged with potassium in the gastrointestinal tract. One gram of resin will remove 1mmol of potassium, but at the same time it will add 2 — 3mmol of sodium, which may lead to a sodium overload. To overcome the constipating effect by the resin, it is formulated in sorbitol solution (20%). The initial dose of 30 — 60g of resin in 120 — 240mL of 20% sorbitol has been recommended. It can be repeated every 1 — 2 hours.

As a last resort, haemodialysis or peritoneal dialysis can be used to remove potassium from the body, in particular, patients with renal impairment. The infusion of furosemide (high ceiling diuretics) with a substantial amount of sodium chloride and bland solution will excrete potassium at the distal tubules of the renal system by sodium exchange mechanism into the urine.

For information on the management of overdose, in New Zealand please contact the National Poisons Information Centre (telephone 0800 POISON or 0800 764 766), or in Australia the Poison Information Centre (telephone 13 11 26).

PRESENTATION AND STORAGE CONDITIONS

**Potassium Chloride, Glucose and Sodium Chloride** infusion solution preparations are supplied in Viaflex plastic bags as a single unit dose. They are available in several strengths as shown in the following table.

<table>
<thead>
<tr>
<th>Code No.</th>
<th>Name of the active components</th>
<th>Osmolarity* (mOsmol/L)</th>
<th>TT50-</th>
<th>Pack Size* (mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHB1704</td>
<td>Potassium Chloride (0.15%, 20) &amp; Glucose [(4.0%, 222); 668 kJ/L] in Sodium Chloride (0.18%, 31)</td>
<td>324 (322)</td>
<td>5540</td>
<td>1000 (12’s)</td>
</tr>
<tr>
<td>AHB1703</td>
<td>Potassium Chloride (0.15%, 20) &amp; Glucose [(4.0%, 222); 668 kJ/L] in Sodium Chloride (0.18%, 31)</td>
<td>324 (322)</td>
<td>5540</td>
<td>500 (18’s)</td>
</tr>
<tr>
<td>AHB1224</td>
<td>Potassium Chloride (0.224%, 30) &amp; Glucose [(4%, 222); 668 kJ/L] in Sodium Chloride (0.18%, 31)</td>
<td>344 (322)</td>
<td>5540/1</td>
<td>1000</td>
</tr>
<tr>
<td>AHB6024</td>
<td>Potassium Chloride (0.149%, 20) &amp; Glucose [(5.0%, 278); 835 kJ/L] in Sodium Chloride (0.45%, 77)</td>
<td>472 (472)</td>
<td>9818</td>
<td>1000</td>
</tr>
<tr>
<td>AHB6066</td>
<td>Potassium Chloride (0.149%, 20) &amp; Glucose [(5.0%, 278); 835 kJ/L] in Sodium Chloride (0.9%, 150)</td>
<td>626 (626)</td>
<td>9819</td>
<td>1000</td>
</tr>
</tbody>
</table>
Note:
Osmolarity $\Phi$ is a calculated figure. In dilute conditions osmolarity is approximately the same as osmolality as shown by the figures in the brackets (mOsmol/kg). 1 gram of glucose provides 16.7 kiloJoules (kJ) of energy.
*Not all packs may be marketed.

Storage

Store below 30°C. Do not freeze.

MEDICINE CLASSIFICATION

General Sale Medicine.

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26 April 2016

*Based on Australian PI amended 5 April 2016 and RSI 2013 0103.*

*Please refer to the Medsafe website (www.medsafe.govt.nz) for most recent data sheet.*

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