CARDIOPLEGIA SOLUTION A

**Solution for cardiac perfusion in viaflex plastic container**

**DESCRIPTION**

Cardioplegia Solution A is a sterile, non-pyrogenic solution in a Viaflex bag. It is used to induce cardiac stasis and to protect the myocardium during open-heart surgery.

Cardioplegia Solution A is an isotonic crystalloid solution based on extracellular fluid ionic concentrations.

Each 1000mL contains:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Concentration</th>
</tr>
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<tbody>
<tr>
<td>Sodium chloride B.P.</td>
<td>6.43g</td>
</tr>
<tr>
<td>Potassium chloride B.P.</td>
<td>1.19g</td>
</tr>
<tr>
<td>Magnesium chloride hexahydrate B.P.</td>
<td>3.25g</td>
</tr>
<tr>
<td>Calcium chloride dihydrate B.P.</td>
<td>176mg</td>
</tr>
</tbody>
</table>

The mixture contains the following ions in 1000mL:

<table>
<thead>
<tr>
<th>Ion</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium</td>
<td>110mmol</td>
</tr>
<tr>
<td>Potassium</td>
<td>16mmol</td>
</tr>
<tr>
<td>Magnesium</td>
<td>16mmol</td>
</tr>
<tr>
<td>Calcium</td>
<td>1.2mmol</td>
</tr>
<tr>
<td>Chloride</td>
<td>160mmol</td>
</tr>
</tbody>
</table>

Approximate osmolality is 275mOsm/kg and approximate pH is 3.7.

Cardioplegia Solution A requires the aseptic addition of 10mL Sodium Bicarbonate 8.4% w/v Injection B.P. prior to use to adjust the pH to 7.4 - 7.8. Following pH adjustment the total sodium ionic concentration is 120mmol/L.

**PHARMACOLOGY**

Perfusion of the coronary circulation by Cardioplegia Solution A allows a quiet, bloodless operative field, a flaccid myocardium and avoidance of air embolism. It protects the myocardium during cardiac surgery by inducing a rapid and complete diastolic arrest,
minimising myocardial energy requirements during arrest, preventing ischaemic damage during the arrest phase and minimising or preventing reperfusion injury once coronary blood flow is restored.

**Sodium and Chloride**
These ions have no specific role in producing cardiac arrest but are important in establishing a solution similar to the composition of normal extracellular fluid and sodium is essential in maintaining the ionic integrity of the myocardium and controlling calcium movements.

**Potassium**
Potassium is present in Cardioplegia Solution A to induce a rapid diastolic arrest, thereby preserving energy supplies (adenosine triphosphate and creatine phosphate for post-ischaemic activity.

**Magnesium**
Addition of magnesium to the solution prevents cellular potassium and magnesium loss, thereby conserving magnesium for its role as an enzymatic cofactor. It appears to counteract the actions of calcium in excitation-contraction coupling, which results in a reduction of energy consumption. It also has a weak arresting action on the heart.

**Calcium**
Calcium helps maintain the integrity of the cell membrane and prevents a condition known as “calcium paradox” occurring during reperfusion.

**Bicarbonate**
This is added to adjust the pH, producing a slightly alkaline (7.4 - 7.8) solution and to compensate for the metabolic acidosis which accompanies ischaemia.

**INDICATIONS**

Following pH adjustment with 10mL of Sodium Bicarbonate 8.4% w/v Injection B.P., Cardioplegia Solution A is used in combination with ischaemia and hypothermia to induce cardiac arrest during open heart surgery and to preserve the myocardium during asystole.

**CONTRAINDICATIONS**

Cardioplegia Solution A must not be administered without the prior addition of sodium bicarbonate.

**PRECAUTIONS**

Cardioplegia Solution A is intended only for cardiac perfusion when the coronary circulation is isolated from the systemic circulation. It must not be injected intravenously.
It should be used only by those trained in cardiac perfusion techniques and open heart surgery and in the presence of inotropic support drugs and the appropriate defibrillation equipment.

The pH of the solution must be adjusted by the aseptic addition of Sodium Bicarbonate Injection. The Cardioplegia Solution A container should then be rapidly inverted five times to ensure complete mixing. It should be cooled to 4°C before use. Once mixed, the solution should be used within 24 hours. It should not be used in serial connections with other containers. The remainder of any partly-used solutions should be discarded.

If large volumes of Cardioplegia Solution A are perfused and permitted to return to the extracorporeal circuit without any venting from the right heart, serum magnesium and potassium levels may rise. It is recommended that the right heart be vented.

It is important that the appropriate dosage of Cardioplegia Solution A be used (see DOSAGE AND ADMINISTRATION below) to ensure that all areas of the myocardium are cooled evenly, especially those areas distal to arterial obstruction in patients with coronary-artery disease. Inadequate dosage may result in uneven cooling, incomplete arrest and ischaemic injury.

Numerous clinical parameters require close monitoring in patients receiving Cardioplegia Solution A. Maintenance of hypothermia is critical and myocardial temperature should be monitored throughout the procedure. Continuous monitoring of myocardial activity is essential.

**Use in pregnancy (Category B2)**

Cardioplegia Solution A has not been subjected to animal reproduction studies. Its effect upon the human foetus has not been established nor has its effect upon reproductive capacity. It should be administered to pregnant women only if unavoidable.

**Use in lactation**

Use of Cardioplegia Solution A in lactation is not recommended.

**Carcinogenic potential**

Cardioplegia Solution A is based on human extracellular fluid. There is no evidence that a carcinogenic potential exists.

**Genotoxicity**

Cardioplegia Solution A is based on human extracellular fluid. There is no evidence that a mutagenic potential exists.
ADVERSE EFFECTS

The use of Cardioplegia solutions during open-heart surgery has been associated with a number of intraoperative and perioperative risks, including myocardial infarction, ECG abnormalities and arrhythmias (including ventricular fibrillation). Spontaneous recovery after Cardioplegia-induced cardiac arrest may be delayed or absent at reperfusion; shock defibrillation may be required to restore normal cardiac function. In addition, Cardioplegia solutions may cause potential electrolyte and acid-base abnormalities.

DOSAGE AND ADMINISTRATION

It is important that an appropriate dose of Cardioplegia Solution A is used to ensure that all areas of the myocardium are cooled evenly, especially those areas distal to arterial obstruction in patients with coronary-artery disease. Inadequate dosage may result in uneven cooling, incomplete arrest and ischaemic injury.

Dosage may vary depending upon the perfusion technique in use, and the preferences and experience of the surgeon. The volume of solution instilled into the aortic root may vary depending upon the duration or type of open heart surgical procedure. The following information is provided for guidance.

The pH must be adjusted with 10mL of Sodium Bicarbonate 8.4% w/v Injection B.P. and the solution cooled to 4°C before use. Following institution of cardiopulmonary bypass at perfusate temperature of 28°C to 30°C, and after cross-clamping of the ascending aorta, the pH adjusted solution is administered by rapid infusion into the aortic root. The initial rate of infusion may be 300mL/m²/minute (approximately 540mL/min for 173cm, 70kg adult with a body surface area of 1.8m²) given over a period of two to four minutes.

Concurrent external cooling (regional hypothermia of the pericardium) may be accomplished by instilling a refrigerated physiological solution such as PLASMALYTE148 (approx. pH 7.4), Sodium Lactate Compound Infusion B.P. (Hartmann’s Solution), or a physiological ice slush into the chest cavity.

Should myocardial activity persist or recur, Cardioplegia Solution A may be reinfused at a rate of 300mL/m²/minute for a period of two minutes. Reinfusion of the solution may be repeated every 20 to 30 minutes or sooner if the myocardial temperature rises above 15°C to 20°C or returning cardiac activity is observed. The regional hypothermia solution around the heart may also be replenished continuously or periodically in order to maintain adequate hypothermia. Suction may be used to remove warmed infusates.
OVERDOSE

Overuse of the solution may result in unnecessary dilation of the myocardial vasculature and leakage into the perivascular myocardium, possibly causing tissue oedema, see PRECAUTIONS and ADVERSE EFFECTS sections.

PRESENTATION AND STORAGE CONDITIONS

Cardioplegia Solution A is supplied in 1000mL Viaflex plastic containers for single use only. The pH of the solution must be adjusted to between 7.4 and 7.8 with 10mL Sodium Bicarbonate 8.4% w/v Injection BP (not supplied) before use. The product should be stored below 30°C.

MEDICINE CLASSIFICATION

General Sale Medicine

NAME AND ADDRESS

Cardioplegia Solution A is distributed in New Zealand by:

Baxter Healthcare Ltd
33 Vestey Drive
Mt Wellington
Auckland 1060
Ph: 09 574 5400

Cardioplegia Solution A is manufactured and distributed in Australia by:

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1 Baxter Drive
Old Toongabbie
NSW 2146

DATE OF PREPARATION

30 March 2016

Based on Australian PI most recent amendment 24 February 2015; and CCSI43220140228.

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

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