### Alert
Albumex® 4 is normally clear or slightly opalescent. If it appears to be turbid, it must not be used and the bottle should be returned unopened to the Australian Red Cross Blood Service. Albumin is not recommended as the initial resuscitating fluid in hypotensive infants. If the product has been stored in the refrigerator it should be allowed to reach room temperature before administration.

### Indication
Hypovolaemia/shock with or without hypoalbuminaemia
Plasma exchange [normal saline recommended]

### Action
Albumin is involved in the maintenance of colloid osmotic pressure, binding and transport of plasma compounds (bilirubin, bile acids, long-chain fatty acids, thyroxine, vitamin D, calcium, magnesium, copper, zinc), renders some potential toxins harmless, is a carrier of nitric oxide and affects pharmacokinetics of many drugs. Albumin 4% is approximately isotonic with osmolality 260 mOsm/kg and pH 6.7 to 7.3. The half-life of albumin is about 19 days.

### Drug Type
Plasma product, manufactured from human plasma collected by the Australian Red Cross Blood Service.

### Trade Name
Albumex® 4

### Presentation
Albumex® 4 50 mL (2 g albumin), 250 mL (10 g albumin) and 500 mL (20 g albumin) bottles. Each bottle contains Human Albumin 40 g/L, sodium 140 mmol/L, chloride 128 mmol/L and octanoate 6.4 mmol/L. Albumex® 4 contains trace amounts of aluminium (≤200 microg/L).

### Dosage/Interval
Hypovolaemia/shock
10 to 20 mL/kg over 10 to 60 minutes titrated to clinical response.

Plasma exchange [normal saline recommended]:

\[
\text{Volume albumin } 4\% \ (mL) = \frac{\text{total blood volume} \times (\text{observed PCV} - \text{desired PCV})}{\text{observed PCV}}
\]

Where total blood volume = 80 mL/kg; desired PCV = 0.55
Infusion rate to match 1:1 with the rate of removal of blood.

### Maximum daily dose
Intravenous

### Preparation/Dilution
Administer undiluted
1. If the product has been stored in the refrigerator it should be allowed to reach room temperature before administration.
2. Always record the name and batch number of the product in order to maintain a link between the patient and the batch of the product.

Dilution of Albumex® 20 to Albumin 4% in case of unavailability of albumin 4%
Albumex® 20 can be diluted to an iso-oncotic protein concentration (4 to 5% albumin) prior to administration. Dilute in the proportion of 1 mL of Albumex® 20 to 4 mL of crystalloid solution (sodium chloride 0.9% or glucose 5% or 10%). DO NOT dilute with water since the lower tonicity will lead to intravascular haemolysis.

### Administration
Intravenously over 10 to 60 minutes titrated to clinical response. Albumex® 4 is packaged in a glass bottle that must be vented during use. [1]

### Monitoring
Continuous cardiorespiratory and temperature observations.

### Contraindications
History of allergy to albumin.

### Precautions
Cardiac failure, pulmonary oedema or severe anaemia.
The sodium concentration in this product is 140 mmol/L. This should be noted when the product is used in patients requiring sodium restriction.
Administration of albumin can aggravate myocardial depression in patients with shock.

### Drug Interactions
Hypotension has been reported in patients given albumin who are on angiotensin converting enzyme (ACE) inhibitors. The addition of other medicines to Albumex® 4 has not been evaluated.

### Adverse Reactions
Allergic reactions.
Possible harms associated with albumin infusion in neonates include fluid overload (pulmonary oedema, impaired gas exchange, worsening oxygenation, chronic lung disease, patent ductus arteriosus, myocardial dysfunction especially for infants with birth asphyxia), neurological injury
**ALBUMIN 4%**
**NEWBORN USE ONLY**

<table>
<thead>
<tr>
<th>Compatibility</th>
<th>Glucose 5% and 10%, glucose-sodium chloride combination. [2]</th>
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<tbody>
<tr>
<td>Incompatibility</td>
<td>Albumex® 4 should not be mixed with protein hydrolysates, amino acid solutions, solutions containing alcohol or solutions containing drugs that bind to albumin (e.g. calcium channel blockers, antibiotics and benzodiazepines).</td>
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<tr>
<td>Stability</td>
<td>Store below 30°C (Do not freeze). Protect from light. If the product has been stored in the refrigerator it should be allowed to reach room temperature before administration. Do not use if the solution has been frozen.</td>
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### Evidence summary

**Efficacy**

**Hypotensive preterm infants:** Two RCTs [3, 4] have compared volume expansion using albumin 5% to normal saline 10 mL/kg in hypotensive preterm infants. Meta-analysis [5] found no significant difference in mortality (typical RR 1.02; 95% CI 0.50, 2.06) or PIVH. No data were available for periventricular leukomalacia (PVL) or long-term disability. Meta-analysis found no significant difference in treatment failure (2 studies, 163 infants; typical RR 0.76, 95% CI 0.54, 1.07) although there was substantial heterogeneity between studies. There were no significant differences for other neonatal morbidities including BPD, PDA, NEC and sepsis. One trial [6] with 20 infants in each group with a systolic BP <40 mmHg compared fresh frozen plasma to albumin 4.5% 15 mL/kg and reported no difference in change in mean BP, although both these groups had a significantly greater increase in mean BP than a control group who received albumin 20% 5 mL/kg. Other outcomes were not reported. Systematic review concluded there is insufficient evidence to determine whether infants with cardiovascular compromise benefit from volume expansion or what type of volume expansion should be used in preterm infants (if at all) [5].

A systematic review of RCTs comparing albumin or PPF with no albumin or PPF or with a crystalloid solution in critically ill patients with hypovolaemia, burns or hypoalbuminaemia included 38 trials with 1,958 deaths among 10,842 participants [10]. Several trials were in newborn infants although no subgroup analysis was performed. Overall, for hypovolaemia there was no difference in death following albumin administration (RR 1.02, 95% CI 0.92 to 1.13). For burns, the relative risk was 2.93 (95% CI 1.28 to 6.72) and for hypoalbuminaemia the relative risk was 1.26 (95% CI 0.84 to 1.88).

Conclusion: Albumin solutions cannot be recommended as treatment for hypotension in newborn infants. [LOE I, GOR C]

**Hyperbilirubinemia:** Trials of albumin infusion pre-exchange transfusion for severe neonatal jaundice reported use of albumin 20% (see albumin 20% formulary).

**Polycythemia:** A single RCT [11] compared isotonic saline versus 5% albumin in 102 term infants as replacement fluid in partial exchange transfusion (PET) for the treatment of neonatal polycythemia. PET with either resulted in a decline in haematocrit up to 24 hours after PET with no difference between groups and no adverse event reported. A systematic review [12] of PET for polycythemia, most RCTs compared plasma preparations to no treatment. The review reported there are no proven clinically significant short or long-term benefits of PET in polycythemic newborn infants who are clinically well or who have minor symptoms related to hyperviscosity, and there may be an increased risk of NEC. Conclusion: Albumin solutions cannot be recommended as the preferred method of PET for polycythemia. [LOE II GOR C]
Liver cirrhosis and nephrotic syndrome: Hypoalbuminemia, oedema and ascites may be manifestation of liver cirrhosis and nephrotic syndrome [13]. Liver disorders: No studies have reported on the use of albumin infusion therapy in neonates with liver disorders. Infusions of albumin has been used in infants and children undergoing high volume paracentesis with a reported lower incidence of post-paracentesis circulatory dysfunction and asymptomatic hyponatremia but no difference in other clinical outcome [14]. However, as a fluid extraction of <200 ml/kg at a slow rate was associated with better haemodynamic stability, albumin infusion is not recommended [13, 14]. Nephrotic syndrome: In infants with congenital nephrotic syndrome and massive oedema, treatment with intravenous albumin and diuretic infusions has been used. However, the treatment has a risk of respiratory failure and congestive heart failure, so use of albumin infusion is cautioned [13].

Safety
There are insufficient data from RCTs in newborn infants to determine the safety of albumin infusion for any indication, although no adverse events attributable to albumin infusion were reported in trials in newborn infants [5, 9, 15]. Human albumin contains no preservatives and undergoes a rigorous pasteurisation process to ensure pathogen inactivation. It does not contain isoagglutinins or blood group substances; hence the risk of minor or major incompatibility is impossible. Additionally, hypersensitivity reactions such as flushing, urticaria, fever and nausea rarely occur following its administration, since albumin preparations are considered non-immunogenic [13]. However, possible harms associated with albumin infusion in neonates include fluid overload (pulmonary oedema, impaired gas exchange, worsening oxygenation, chronic lung disease, patent ductus arteriosus, myocardial dysfunction especially for infants with birth asphyxia), neurological injury (cerebral oedema, intraventricular haemorrhage due to rapid bolus administration), salt loading and fluid retention, and higher cost compared with crystalloids [13].

References