Resonium (Polystyrene sulfonate resin) 2021

Newborn use only

Alert	Insulin-glucose and salbutamol (albuterol) infusions are more effective and safer options for treatment of hyperkalaemia.(1) Not for oral administration in neonates. Effective lowering of serum potassium with Resonium **may take hours**. The efficiency of potassium exchange is unpredictable and variable. Available as sodium or calcium resins Common international brand name for sodium polystyrene sulfonate is Kayexalate.
Indication	Hyperkalaemia (serum potassium greater than 6.5 mmol/L)(1)
Action	Removes potassium from body by exchanging it within the gut for sodium/calcium. *In vivo*, 1 gram of resin exchanges about 1 mmol of potassium.(2)
Drug type	Cation exchange resin.
Trade name	Resonium A Powder for suspension (Sodium polystyrene sulfonate) Calcium Resonium Powder for suspension (Calcium polystyrene sulfonate)
Presentation	Resonium A powder for suspension – Sodium content is 4.1 mmol/g of Resonium A.(2) Calcium Resonium powder for suspension – Calcium content is 1.6-2.4 mmol/g of Resonium.(2)
Dose	**Dose:** 1 g/kg every 4-6 hours, followed by colonic irrigation 8-12 hours after the last resin dose (see Administration section)(3, 4) **Recommended resin:** **Resonium A:** if plasma sodium is normal or if plasma calcium is high. **Calcium Resonium:** if plasma sodium is high. **Duration of therapy:** Cease once serum potassium returns to normal (<6 mmol/L)
Dose adjustment	No specific information.
Maximum dose	
Total cumulative dose	
Route	Rectal
Preparation	Dilute each gram/kg of Resonium with 3-5mL/kg of Water for Injection or glucose 10%.
Administration	PR only, **should not be administered orally.** **Aim to retain dose rectally for as long as possible, at least 30 minutes.** **Evacuation of resin:** Evacuate Resonium 8-12 hours later with glycerine enema or 1 to 2 mL of sodium chloride 0.9%.
Monitoring	Serum electrolytes: potassium, sodium, calcium (hypercalcaemia) and magnesium (hypomagnesaemia). Cardiorespiratory and apnoea monitoring.
Contraindications	Resonium A and Calcium Resonium **should not be administered orally** to neonates Neonates with reduced gut motility (e.g. post-operatively or drug induced).(2) History of hypersensitivity to polystyrene sulfonate resins. Serum potassium levels less than 5 mmol/L. Obstructive bowel disease.
Precautions	*Hypercalcaemia, hyperparathyroidism:* Avoid calcium resin. Congestive heart failure, hypernatraemia, sodium overload: Avoid sodium resin.
Drug interactions	Not applicable.
Adverse reactions	Hypokalaemia, hypernatraemia, hypocalcaemia, hypercalcaemia, hypomagnesaemia. Water overload Gastrointestinal: Perforation, haemorrhage, necrotising enterocolitis.
Compatibility	Not applicable
Incompatibility	Not applicable
Stability	Suspensions of the resin should be freshly prepared and not stored beyond 24 hours. Once reconstituted, Resonium A and Calcium Resonium is a cream to light brown coloured suspension in which small white particulates may remain visible.
Storage	Store below 30°C.
Excipients	Resonium A and Calcium Resonium: Saccharin sodium and vanillin.

Special comments	Mild laxatives may be used to treat or prevent constipation; do not use sorbitol – a hyperosmotic laxative (risk of colonic necrosis) or magnesium-containing laxatives; stop treatment if significant constipation occurs. Excessive dosage or inadequate dilution could result in impaction of resin, particularly in early infancy.
Evidence	**Efficacy** No firm recommendations can be made on resonium for the treatment of hyperkalemia because of limited information from small studies of uncertain quality,(LOE I; GOR B).(1) Two small randomised trials identified in Cochrane review suggested that the combination of insulin and glucose is preferred over treatment with rectal cation-resin for hyperkalaemia in preterm infants.(1) RCT by Malone et al enrolled 12 preterm infants ≤ 28 weeks GA. Sodium polystyrene sulfonate (Kayexalate) was prepared in 25% sorbitol and administered rectally 1 g/kg every 6 hours in 5 infants and glucose-insulin infusion was administered in 7 infants. All 5 infants treated with Kayexalate had an increase in serum K^+ concentration of more than 0.5 mmol/L within the first 6 hours of treatment, and treatment was considered to have failed. Hu et. al., enrolled 40 VLBW infants with non-oliguric hyperkalaemia and randomly divided them into insulin (RI) infusion group and Kayexalate group. In Kayexalate group (n=20), the dose of Kayexalate was 1g/kg given rectally every 4 hours. The duration of hyperkalaemia in RI group was significantly shorter in comparison to Kayexalate group. The incidence of grade II and above intraventricular haemorrhage (IVH) was significantly low in RI group (15% vs 50%). Sample sizes of the trials in this meta-analysis were very small to make any firm recommendations in clinical practice, but insulin and glucose infusion and albuterol infusion were found to be safer and more effective in comparison to cation exchange resin. (1, 3-5) **Safety** Gastrointestinal haemorrhage and intestinal perforation and necrosis have been reported. (6-10) Sorbitol used for Resonium enema preparation have been implicated for these complications. Incidence of ≥ grade 2 intraventricular haemorrhage was higher in Kayexalate group in comparison to glucose-insulin treated infants. (3) **Pharmacokinetics** Polystyrene sulfonate is not absorbed from the gastrointestinal tract.(2)
Practice points	There are safer and more effective interventions including insulin-glucose infusion and salbutamol (albuterol) infusion to treat hyperkalaemia. (1) Resonium preparation in sorbitol enemas are hypertonic and associated with intestinal complications including necrosis and perforation. (6-9) To reduce the likelihood of intestinal complications, evacuation of rectal Resonium by irrigation with either glycerine or 1 to 2 mL of 0.9% sodium chloride can be performed. (10, 11) In children and neonates particular care should be observed with rectal administration, as excessive dosage or inadequate dilution could result in impaction of the resin. Due to the risk of GI haemorrhage, colonic necrosis or sodium overload, particular care should be observed in preterm infants or low birth weight infants.
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