

Alert	High risk of hypoglycaemia. Insulin binds to the plastic of giving sets. Flush the plastic tubing with 20 mL of prepared insulin solution into a receptacle prior to connecting to the infant. This is to saturate the binding. Insulin concentrations ≤ 0.05 Unit/mL are not reliably delivered even after preconditioning and flushing.								
Indication	Treatment of persistent hyperglycaemia. [For treatment of hyperkalaemia, see Insulin – hyperkalaemia].								
Action	Insulin is a polypeptide hormone that acts on cells throughout the body to stimulate uptake, utilisation and storage of glucose resulting in a lowering of blood glucose. Insulin stimulates the liver to store glucose in the form of glycogen and facilitates the entry of glucose into muscle and adipose tissue. It inhibits lipolysis, proteolysis and gluconeogenesis, enhances protein synthesis and conversion of excess glucose into fat.								
Drug Type	Polypeptide hormone – lowers blood glucose.								
Trade Name	Actrapid [Novo Nordisk] Humulin R [Eli Lilly] Hypurin Neutral Injection [Aspen]								
Presentation	Vial: 100 units/mL in a 10 mL vial and 3 mL Pen-fill.								
Dosage/Interval	Treatment of hyperglycaemia: <u>Intravenous:</u> Starting dose: 0.05 unit/kg/hour. Dose range: 0.01 to 0.1 unit/kg/hour. Titrate in small increments to blood glucose: Target blood glucose 8 to 10 mmol/L [1, 2].								
Route	IV								
Preparation/Dilution	<p>SINGLE STRENGTH INFUSION (suitable if weight > 1 kg)</p> <table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 50%;">Infusion strength</th> <th style="width: 50%;">Prescribed amount</th> </tr> </thead> <tbody> <tr> <td>1 mL/hour = 0.1 unit/kg/hour</td> <td>5 unit/kg insulin and make up to 50 mL</td> </tr> </tbody> </table> <p>Draw up 0.6 mL (60 units of insulin) and add 29.4 mL glucose 5%, glucose 10% or sodium chloride 0.9% to make a final volume of 30 mL with a concentration of 2 unit/mL. FURTHER DILUTE: 2.5 mL/kg (5 units/kg) of the above solution and dilute with glucose 5%, glucose 10% or sodium chloride 0.9% to a final volume of 50 mL with a concentration of 0.1 unit/kg in each mL. Infusion at 1 mL/h = 0.1 unit/kg/hour</p> <p>DOUBLE STRENGTH INFUSION</p> <table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 50%;">Infusion strength</th> <th style="width: 50%;">Prescribed amount</th> </tr> </thead> <tbody> <tr> <td>1 mL/hour = 0.2 unit/kg/hour</td> <td>10 unit/kg insulin and make up to 50 mL</td> </tr> </tbody> </table> <p>Draw up 0.6 mL (60 units of insulin) and add 29.4 mL glucose 5%, glucose 10% or sodium chloride 0.9% to make a final volume of 30 mL with a concentration of 2 unit/mL. FURTHER DILUTE: 5 mL/kg (10 unit/kg) of the above solution and dilute with glucose 5%, glucose 10% or sodium chloride 0.9% to a final volume of 50 mL with a concentration of 0.2 unit/kg in each mL. Infusion at 1mL/h = 0.2 unit/kg/hour</p>	Infusion strength	Prescribed amount	1 mL/hour = 0.1 unit/kg/hour	5 unit/kg insulin and make up to 50 mL	Infusion strength	Prescribed amount	1 mL/hour = 0.2 unit/kg/hour	10 unit/kg insulin and make up to 50 mL
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Administration	Intravenous: Insulin binds to the plastic of giving sets. Flush the plastic tubing with 20 mL of prepared insulin solution into a receptacle prior to connecting to the infant. This is to saturate the binding. Do not filter infusion. Insulin also binds to the filter. Can be infused with maintenance fluids. Recommend attaching insulin infusion after the filter. Do not bolus other drugs through this line.								
Monitoring	Blood glucose concentration Initiation: Every 30 minutes until stabilised. Stabilisation: 4–6 hourly After cessation of infusion: At 30 minutes and at 1 hour Alteration of infusion: Within 1 hour Serum potassium concentration.								

Contraindications	Hypersensitivity to regular insulin or any of its components. During episodes of hypoglycaemia.
Precautions	Hypoglycaemia is a common adverse effect. Blood glucose must be monitored closely to detect hypoglycaemia. Do not adjust the rate of the maintenance solution or other infusions when insulin is commenced or the insulin infusion rate is altered. For example, if insulin is commenced or the rate of the insulin infusion is increased, do not turn down the maintenance solution to compensate for the total volume delivered. The amount of glucose being delivered to the infant will then be reduced as the insulin is commenced or dose is increased, possibly causing hypoglycaemia in an already unstable infant. If ceasing insulin or changing the strength, be careful to remove and replace the previous line and T-piece to avoid flushing through insulin remaining in the tubing. Administer IV bolus medication via separate IV access to avoid insulin bolus administration.
Drug Interactions	The following may reduce insulin requirements: Octreotide, beta-adrenergic blocking agents, angiotensin converting enzyme inhibitors, salicylates, anabolic steroids, alpha-adrenergic blocking agents, quinine, quinidine and sulfonamides. The following may increase insulin requirements: Thiazides, furosemide, ethacrynic acid, glucocorticoids, thyroid hormones, sympathomimetics, growth hormone, diazoxide.
Adverse Reactions	Hypoglycaemia; hypokalaemia; and hyponatraemia. Urticaria and anaphylaxis (extremely rare) Insulin resistance may develop resulting in a larger dose requirement.
Compatibility	Fluids: Amino acid solution, glucose 5%, glucose 10%, glucose 50%, lipid emulsion, sodium chloride 0.9%. Y-site administration: Amiodarone, azathioprine sodium; aztreonam; bretylium tosylate; bumetanide; buprenorphine hydrochloride; calcium chloride dihydrate; calcium gluconate monohydrate; caspofungin acetate;; cefazolin sodium; cefepime hydrochloride; cefotaxime; ceftazidime; ceftizoxime; ceftriaxone sodium; cefuroxime; chloramphenicol sodium succinate; clindamycin phosphate; cyanocobalamin; dexamethasone sodium phosphate;; enalaprilat; epirubicin hydrochloride; epoetin alfa; erythromycin lactobionate; fentanyl citrate; fluconazole; folic acid (as sodium salt); foscarnet sodium; fosphenytoin sodium; ganciclovir sodium; hydrocortisone sodium succinate; ibuprofen lysine; imipenem-cilastatin sodium; indometacin sodium trihydrate; lactated ringer's injection; lidocaine hydrochloride; magnesium sulfate; mannitol; meropenem; methadone hydrochloride; methylprednisolone sodium succinate; metoclopramide hydrochloride; metoprolol tartrate; metronidazole; milrinone lactate; naloxone hydrochloride; nitroglycerin; nitroprusside sodium; octreotide acetate; pancuronium bromide; penicillin g potassium; penicillin g sodium; phenobarbital sodium; phytonadione; piperacillin sodium; potassium acetate; potassium chloride; procainamide hydrochloride; promethazine hydrochloride; propofol; pyridoxine hydrochloride; remifentanyl hydrochloride; sodium bicarbonate; streptokinase; sufentanil citrate; tacrolimus; terbutaline sulfate; thiamine hydrochloride; ticarcillin disodium; ticarcillin disodium-clavulanate potassium; urokinase; vancomycin hydrochloride; vecuronium bromide; verapamil hydrochloride; voriconazole In syringe: Insulin NPH.
Incompatibility	Y-site administration: Cefoxitin; chlorpromazine; diazepam; diazoxide; dopamine; glycopyrronium bromide (glycopyrrolate); isoprenaline; ketamine; labetalol; noradrenaline (norepinephrine); phentolamine; phenylephrine; phenytoin; piperacillin sodium-tazobactam sodium; polymyxin; propranolol; protamine; quinidine; rocuronium; sulfamethoxazole-trimethoprim;
Stability	Actrapid: Prepared solutions are stable at room temperature (< 25°C) for 24 hours. Humulin R: Prepared infusions can be stored refrigerated for 48 hours and may be used at room temperature for an additional 48 hours. Novolin R: Prepared solutions are stable for 24 hours at room temperature [Micromedex].
Storage	Store human insulin preparations between 2 and 8°C. The shelf life is 30 months when stored between 2 and 8°C. Do not freeze. Human insulin preparations which have been frozen must not

Insulin – Hyperglycaemia

Newborn Use Only

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	be used. Protect from excessive heat and light. Should appear clear and colourless. After first use, the vials may be kept at room temperature (below 25°C) for 4 weeks.
Special Comments	<p>Insulin is incompatible with many drugs and hence should be administered via a single, dedicated line.</p> <p>Insulin is adsorbed to the plastic of intravenous bags, syringes, and tubing which reduces the delivery of insulin [3-5].</p> <p>Twenty mL of insulin priming solution at concentrations of 0.1 Unit/mL and 0.05 Unit/mL were found to deliver 80% and 26.5% of the expected insulin. Insulin concentrations \leq 0.05 Unit/mL are not reliably delivered even after preconditioning and flushing [3,4].</p>
Evidence summary	Refer to full version.
References	Refer to full version.

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