



# INSULIN NEUTRAL (SHORT ACTING) ACTRAPID®

<b>Indication</b>	<ul style="list-style-type: none"> <li>• Hyperglycaemia (e.g. greater than 15 mmol/L on two occasions)</li> </ul>		
<b>INTRAVENOUS</b>	<b>Presentation</b>	<ul style="list-style-type: none"> <li>• Vial: 100 units in 1 mL (10 mL vial or Penfill® 3 mL vial)</li> </ul>	
	<b>Dosage (infusion)</b>	<ul style="list-style-type: none"> <li>• Starting rate 0.05–0.1 units/kg/hour<sup>1,2</sup> <ul style="list-style-type: none"> <li>○ Titrate according to blood glucose levels<sup>1</sup></li> </ul> </li> </ul>	
	<b>Preparation</b>	<ul style="list-style-type: none"> <li>• Refer to Quick guide for half strength, single strength (25 units/kg) and multiple strength infusions</li> <li>• For small dose volumes less than 0.1 mL (10 units) complete the following additional steps prior to Quick guide reconstitution <ul style="list-style-type: none"> <li>○ Draw up 0.1 mL (10 units) insulin into 1 mL syringe</li> <li>○ Draw up 0.9 mL water for injection into 2 mL syringe and draw back plunger to leave approximately 0.2 mL additional space</li> <li>○ Without drawing back the plunger, add the 10 units (0.1 mL) insulin to the water for injection</li> <li>○ <i>Concentration now equal to 10 units in 1 mL (1 unit in 0.1 mL)</i></li> </ul> </li> <li>• Draw up desired units/kg from the 10 units in 1 mL (1 unit in 0.1 mL) solution prepared above and refer to Quick Guide for further reconstitution</li> </ul>	
	<b>Administration</b>	<ul style="list-style-type: none"> <li>• Where available, use infusion pump drug library</li> <li>• Make up the infusion and prime extension tubing (do not filter)</li> <li>• Leave infusion for 30 minutes to allow insulin to coat extension line</li> <li>• Before connecting to baby, purge extension line to clear solution that has undergone adsorption from infusion line</li> </ul>	
<b>SUBCUT</b>	<b>Presentation</b>	<ul style="list-style-type: none"> <li>• Vial: 100 units in 1 mL (10 mL vial or Penfill® 3 mL vial)</li> </ul>	
	<b>Dosage</b>	<ul style="list-style-type: none"> <li>• Starting range 0.05–0.2 units/kg every 6 to 12 hours (on neonatologist advice)<sup>3</sup></li> </ul>	
	<b>Preparation</b>	<ul style="list-style-type: none"> <li>• <u>For babies less than 1 kg</u> <ul style="list-style-type: none"> <li>○ Draw up 0.1 mL (10 units) insulin into a 1 mL syringe.</li> <li>○ Draw up 4.9 mL water for injection into a 5 mL syringe and draw back plunger to leave approximately 0.2 mL additional space</li> <li>○ Without drawing back the plunger, add the 0.1 mL of insulin to the water for injection</li> <li>○ <i>Concentration now equal to 2 units in 1 mL (0.2 units in 0.1 mL)</i></li> </ul> </li> <li>• <u>For babies 1 to 2 kg</u> <ul style="list-style-type: none"> <li>○ Draw up 0.1 mL (10 units) insulin into a 1 mL syringe</li> <li>○ Draw up 2.4 mL water for injection into a 3 mL syringe, then draw back plunger to leave approximately 0.2 mL additional space.</li> <li>○ Without drawing back the plunger, add the 0.1 mL of insulin to the water for injection</li> <li>○ <i>Concentration now equal to 4 units in 1 mL (0.4 units in 0.1 mL)</i></li> </ul> </li> </ul>	
	<b>Administration</b>	<ul style="list-style-type: none"> <li>• Draw up prescribed dose</li> <li>• Do not draw back plunger before injection</li> </ul>	
<b>Special considerations</b>	<ul style="list-style-type: none"> <li>• Avoid concurrent administration of: <ul style="list-style-type: none"> <li>○ Bolus medicines during insulin infusion</li> <li>○ Infusions other than those frequently required for sick neonates who have limited venous access (e.g. morphine and midazolam, dopamine and dobutamine)</li> </ul> </li> <li>• Do not include insulin infusion volumes/rates in total daily fluid calculations</li> <li>• Preparation instructions are specific to avoid the small (but potent) volumes contained in drawing up needles being inadvertently added to total desired amount of insulin</li> <li>• Refer to Queensland Clinical Guideline: <i>Newborn hypoglycaemia</i><sup>4</sup></li> <li>• For hyperkalaemia, refer to NeoMedQ monograph: <i>Glucose and Insulin</i><sup>5</sup></li> </ul>		
<b>Monitoring</b>	<ul style="list-style-type: none"> <li>• BGL</li> </ul>		

<b>Compatibility</b>	<ul style="list-style-type: none"> <li>• Fluids <ul style="list-style-type: none"> <li>○ 5% glucose<sup>6</sup>, 10% glucose<sup>6</sup>, 50% glucose<sup>6</sup>, 0.9% sodium chloride<sup>6</sup>, parenteral nutrition<sup>7</sup></li> </ul> </li> <li>• Y-site (avoid bolus use of all drugs within same line) <ul style="list-style-type: none"> <li>○ Aciclovir<sup>8</sup>, benzylpenicillin<sup>8</sup>, calcium chloride<sup>8</sup>, calcium gluconate<sup>8</sup>, ceftazidime<sup>8</sup>, fluconazole<sup>8</sup>, imipenem-cilastatin<sup>8</sup>, magnesium sulphate<sup>8</sup>, meropenem<sup>8</sup>, milrinone<sup>8</sup>, phenobarbitone<sup>8</sup>, potassium chloride<sup>8</sup>, sodium bicarbonate<sup>8</sup>, vancomycin<sup>8</sup></li> </ul> </li> <li>• Use with caution (concentration dependent or variable compatibility) <ul style="list-style-type: none"> <li>○ Morphine<sup>8</sup>, dobutamine<sup>8</sup>, dopamine<sup>8</sup> (monitor for clouding or turbidity of solution in line) midazolam<sup>8</sup>, noradrenaline<sup>8</sup></li> </ul> </li> </ul>
<b>Incompatibility</b>	<ul style="list-style-type: none"> <li>• Drugs <ul style="list-style-type: none"> <li>○ Cefoxitin<sup>8</sup>, diazoxide<sup>8</sup>, phenylephrine<sup>8</sup>, phenytoin<sup>8</sup>, piperacillin-tazobactam (EDTA-free)<sup>8</sup>, protamine<sup>8</sup>, rocuronium<sup>8</sup>, sulfamethoxazole-trimethoprim<sup>8</sup></li> </ul> </li> </ul>
<b>Interactions</b>	<ul style="list-style-type: none"> <li>• <u>Reduced insulin requirements</u> with concurrent administration of<sup>9</sup>: <ul style="list-style-type: none"> <li>○ Octreotide, nonselective beta-adrenergic blocking agents, angiotensin converting enzyme (ACE) inhibitors, alpha-adrenergic blocking agents, sulfonamides</li> </ul> </li> <li>• <u>Increased insulin requirements</u> with concurrent administration of<sup>9</sup>: <ul style="list-style-type: none"> <li>○ Thiazides, frusemide, ethacrynic acid diuretics, glucocorticoids, thyroid hormones, sympathomimetics, octreotide, growth hormone, diazoxide</li> </ul> </li> <li>• Beta-blocking agents may mask symptoms and delay recovery from hypoglycaemia<sup>9</sup></li> </ul>
<b>Stability</b>	<ul style="list-style-type: none"> <li>• Store in fridge at 2–8 °C. Protect from light<sup>10</sup></li> <li>• Do not use preparations which have been frozen, are turbid or coloured<sup>10</sup></li> <li>• Discard opened insulin vial after 28 days (keep refrigerated)<sup>10</sup></li> </ul>
<b>Side effects</b>	<ul style="list-style-type: none"> <li>• Blood pathology: hypoglycaemia<sup>11</sup></li> </ul>
<b>Actions</b>	<ul style="list-style-type: none"> <li>• Lowers blood glucose levels by binding to insulin receptors to increase glucose uptake and inhibit hepatic glucose output<sup>10</sup></li> </ul>
<b>Abbreviations</b>	BGL blood glucose monitoring
<b>Keywords</b>	Hypoglycaemia, hyperglycaemia, insulin, actrapid®

### Quick guide: insulin IV INFUSION concentrations

Strength	Draw up insulin units/kg	Make up to total volume (mL) with 0.9% sodium chloride	Infusion rate (mL/hour)	Delivers (units/kg/hour)
½ strength	12.5 units/kg	50 mL	@ 0.1 mL/hour	0.025 units/kg/hour
1x strength	25 units/kg	50 mL	@ 0.1 mL/hour	0.05 units/kg/hour
2x strength	50 units/kg	50 mL	@ 0.1 mL/hour	0.1 units/kg/hour
4x strength	100 units/kg	50 mL	@ 0.1 mL/hour	0.2 units/kg/hour
8x strength	200 units/kg	50 mL	@ 0.1 mL/hour	0.4 units/kg/hour
16x strength	400 units/kg	50 mL	@ 0.1 mL/hour	0.8 units/kg/hour
32x strength	400 units/kg	<b>25 mL</b>	@ 0.1 mL/hour	1.6 units/kg/hour
64x strength	800 units/kg	<b>25 mL</b>	@ 0.1 mL/hour	3.2 units/kg/hour
	<i>Equivalent to 1600 units/kg in 50 mL. Infusion reaches an undiluted insulin state when baby weight is more than 3 kg (e.g. 800 units x 3 kg=24 mL of undiluted 100 units/mL insulin vials)</i>			
128x strength	1600 units/kg	<b>25 mL</b>	@ 0.1 mL/hour	6.4 units/kg/hour
	<i>Equivalent to 3200 units/kg in 50 mL. Infusion reaches an undiluted insulin state when baby weight is more than 1.5 kg (e.g. 1600 units x 1.5 kg=24 mL of undiluted 100 units/mL insulin vials)</i>			
256x strength	1600 units/kg	<b>12.5 mL</b>	@ 0.1 mL/hour	12.8 units/kg/hour
	<i>Equivalent to 6400 units/kg in 50 mL. Infusion reaches an undiluted insulin state when baby weight is more than 0.75 kg (e.g. 1600 units x 0.75 kg=24 mL of undiluted 100 units/mL insulin vials)</i>			

**Manual calculation when using undiluted insulin (100 unit in 1 mL)**

Steps for manual calculations	
<b>Formula =</b>	$\frac{\text{strength per 0.1 mL}}{\text{weight (kg)}} \text{ infused at 0.1 mL/hour} = \text{number of units/kg/hour}$
<b>Example: 2 kg baby using undiluted insulin (100 units in 1 mL)</b>	
1. Strength per 0.1 mL	100 units in 1 mL = 10 units in 0.1 mL
2. Perform calculation	$\frac{10 \text{ units per 0.1 mL}}{2 \text{ kg}} \text{ infused at 0.1 mL/hour} = 5 \text{ units/kg/hour}$

The Queensland Clinical Guideline *Neonatal Medicines* is integral to and should be read in conjunction with this monograph. Refer to the disclaimer. Destroy all printed copies of this monograph after use.

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**Document history**

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