INSULIN – HYPERGLYCAEMIA

This drug must be guardrailed
No filters on the line

<table>
<tr><td>Trade Name</td><td>Actrapid® (Human) (Novo-Nordisk)</td></tr>
<tr><td>Class</td><td>Neutral rapid acting insulin</td></tr>
<tr><td>Mechanism of Action</td><td>Binds to cell membrane insulin receptors and promotes protein, lipid and glycogen synthesis as well as peripheral glucose uptake.
Insulin is a major fetal growth factor and treatment of preterm infants with insulin may improve weight gain and glucose tolerance</td></tr>
<tr><td>Indications</td><td>Hyperglycaemia - BSL of 10mmol/L or more, for two consecutive levels four hours apart. Usually associated with glycosuria</td></tr>
<tr><td>Contraindications</td><td>Hypoglycaemia
Hypersensitivity to human insulin</td></tr>
<tr><td>Supplied As</td><td>100 unit/mL 3mL vial</td></tr>
<tr><td>Dilution
Two dilution steps required</td><td>See Insulin for hyperglycaemia infusion sheet
<table>
<tr><th>Drug</th><th>0.9% Saline Added</th><th>Total Volume</th><th>Concentration</th></tr>
<tr><td>0.5mL (50 unit)</td><td>49.5mL</td><td>50mL</td><td>1 unit/mL</td></tr>
</table>
Then further dilute by taking (5 x weight in kg) in mL and make up to 20mL with normal saline: 0.2mL/hr = 0.05 unit/kg/hr
If baby is >4kg the max concentration will be exceeded and the infusion will need to be made half strength</td></tr>
<tr><td>Dosage
Must chart guardrail and use Alaris pump</td><td>0.03 – 0.3 unit/kg/hr
Changes in dosing to be by the Insulin Computer</td></tr>
<tr><td>Guardrails</td><td>Concentration: Min - 0.07unit/mL Max – 1 unit/mL
Concentration can only be entered up to 2 decimal points so use Swedish rounding. Occasionally the rate requested by the computer may be different from what the pump provides ie: 0.21 vs 0.2 mL/hr – not clinically relevant
Soft Alert Min: 0.03 unit/kg/hr Hard Alert Max: 0.3 unit/kg/hr
Soft Alert Max: 0.2 unit/kg/hr Default Setting: 0.05 unit/kg/hr</td></tr>
<tr><td>Interval</td><td>Continuous intravenous Infusion</td></tr>
</table>

Administration	Flush the tubing with 10mL of solution to ensure that plastic receptor binding occurs. **Filters are not be used** on the insulin line and if present must be removed as they absorb the insulin Infuse through the same iv line as continuous TPN or 10% glucose and **do not give any boluses** through this iv to avoid the baby receiving any boluses of insulin
Compatible With	**Solutions:** glucose 5%, glucose 10%, glucose 50% lactated ringers, sodium chloride 0.9%, SMOF Lipid, TPN. **Y-site:** Aciclovir, adrenaline*, aminophylline, amiodarone*, amphotericin B complex, atenolol, ascorbic acid, atropine, aztreonam, benzylpenicillin, calcium chloride, calcium gluconate, cefazolin, cefepime, cefotaxime, ceftazidime, ceftriaxone, cefuroxime, clarithromycin, digoxin, dobutamine, epoetin, ephedrine, ertapenem, erythromycin, fluconazole, folic acid, furosemide, ganciclovir, gentamicin* heparin, hydrocortisone sodium succinate, ibuprofen, imipenem /cilastatin, indometacin, lidocaine, magnesium sulphate, meropenem, methylprednisolone, metronidazole, milrinone, morphine, midazolam, noradrenaline*, octreotide, paracetamol, pancuronium, phenobarbital, potassium chloride, propofol, ranitidine, sodium bicarbonate, sodium nitroprusside, thiamine, ticarcillin, vancomycin. *There are mixed reports on compatibility of insulin with these medications. Check with the pharmacist, in some cases it may be necessary to use a separate line.
Incompatible With	Chlorothiazide, diazepam, diazoxide, glycopyrrolate, labetalol, phenylephrine, phenytoin, phentolamine, piperacillin tazobactam, sulfamethoxazole/trimethoprim, thiopentone, tobramycin, vasopressin. Dopamine (data from studies using higher concentrations than we use for both infusions suggest variable compatibility). We have used insulin in combination with dopamine without detectable problems for several years. If concerned change to dobutamine which is compatible at any concentration.
Interactions	Concurrent use of betablockers eg atenolol, sotalol, ace inhibitors eg enalapril, alpha blockers eg doxazosin, anabolic steroids eg testosterone, octreotide, quinine, quinidine and sulfonamides may reduce insulin requirements. Furosemide, glucocorticoids e.g. hydrocortisone, sympathomimetics eg adrenaline, noradrenaline, salbutamol, octreotide growth hormone and diazoxide may increase insulin requirements. Betablockers may mask the symptoms of hypoglycaemia.

Monitoring	Check blood sugars 1-2 hourly initially then 3-4 hourly Measure blood glucose concentrations frequently after starting insulin infusion and after changes are made to the infusion rate. If the baby is on enteral feeds and these are not absorbed then the insulin requirement will fall due to a lower glucose intake
Stability	Single use vial only Change continuous infusions after 24 hrs
Storage	Store Actrapid insulin vials in the refrigerator at 2 – 8 ^{o}C. **Do not freeze** Do not use any insulin solution that is cloudy, unusually viscous, precipitated, or even slightly coloured
Adverse Reactions	Hypoglycaemia Over supplementation of insulin once euglycaemia has been achieved may cause metabolic acidosis
Metabolism	Liver, more than 50% (Paterson et al, 1983). Kidney, 30% (Paterson et al, 1983). Adipose tissue/muscle, about 20% (Paterson et al, 1983).
Comments	It is Christchurch Neonatal Service policy that all Actrapid Insulin vials should be used and then discarded after opening*. *This is because Actrapid doesn't contain preservative and is a potential cause of infection for neonates who most commonly receive insulin by IV infusion (rather than subcutaneous injection which is the most common route of administration for insulin in older patients).
References	1. Paterson KR, Paice BJ & Lawson DH: Undesired effects of insulin therapy. Adverse Drug React Acute Poisoning Rev 1983; 2:219-234. 2. Trissell Handbook of injectable Drugs 10th Edition. 3. NZHPA Notes on injectable Drugs 5th Edition 4. www.micromedexsolutions.com 5. www.anmfonline.org 6. Rennie JM, Roberton NRC, Textbook of Neonatology 3rd Ed1999
Updated By	P Schmidt, B Robertshawe December 2005 A Lynn, B Robertshawe Oct 2007 A Lynn, B Robertshawe July 2009, September 2009, June 2010 A Lynn, B Robertshawe October 2012 (re-order profile) A Lynn May 2013 (max conc and weight) A Lynn, B Robertshawe August 2024 (routine review)