Antibiotic Lock Therapy for Catheter Related Blood Stream Infections

**Purpose**

This guideline provides best practice recommendations for the management of catheter-related infections, using Antibiotic lock therapy, especially in high risk patients.

**Scope**

This guideline provides information for all Children’s Health Queensland (CHQ) Clinical Staff.

**Related documents**

- CHQ-PROC-03450 Intravascular Access Device, Management (peripheral and Central Venous Access Devices)
- CHQ-PROC-01001 Medication – Prescribing
- CHQ-PROC-01039 Medication - Administration
- CHQ-NS-03453 IVAD-Central Venous Catheters: Nursing Care and Management of Tunnelled (cuffed and non-cuffed) CVC in Paediatric Patients
- CHQ-NS – 03454 IVAD - Venous Port Device: Nursing Care and Management of Totally Implanted Venous Port Device (Port) in Paediatric Patients
- CHQ-GDL-01060 Use of Taurolidine/ Citrate Lock Solution in the Prevention of Central Venous Catheter Related Bacteraemia
Guideline for use of antibiotic lock therapy in the treatment of catheter related blood stream infections

Antibiotic Lock therapy is indicated for patients with catheter related blood stream infections involving long-term catheters with no signs of exit site or tunnel infection, where catheter salvage is the goal. The paediatric patient group requiring antibiotic locks are likely to receive parenteral nutrition, haemodialysis or chemotherapy.

The optimal duration for antibiotic lock therapy is 7 to 14 days. Antibiotic lock solutions contain antimicrobial (for example: vancomycin, cefazolin, ciprofloxacin, linezolid, teicoplanin, gentamicin or ampicillin) mixed with 0.9% sodium chloride or trisodium citrate, in sufficient volume to fill the catheter lumen (Table 1).

Once the causative organism is identified, the decision to use antibiotic lock therapy, usually simultaneously with systemic antibiotic therapy, must always be made in consultation with the Infectious diseases team (IMPS).

**Alert**

Antibiotic Lock Therapy requires prior approval from Infection Management Consultant/Fellow

For antibiotics that are not listed on the [List of Approved Medicines (LAM)](https://example.com/#list), Infectious Management and Prevention Service (IMPS) and [Individual Patient Approval](https://example.com/#approval) by Executive Director of Medical Services is required, prior to initiation of therapy.

**Table 1: Specific catheter lock volumes associated with each device**

<table>
<thead>
<tr>
<th>Device</th>
<th>Approximate volume of lumen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tunneled Cuffed Central Venous Catheter</td>
<td>2mL</td>
</tr>
<tr>
<td>Peripherally inserted central venous catheter (PICC)</td>
<td>1mL</td>
</tr>
<tr>
<td>Totally implantable Venous Port Device</td>
<td>4mL</td>
</tr>
</tbody>
</table>

**Alert**

Contraindication: Previous serious allergic reaction to the antibiotic.

Contact the Infectious Diseases unit or clinical microbiology for appropriate advice regarding alternative antimicrobial selection.
1. **Vancomycin Lock**

Vancomycin antibiotic lock concentration of 5mg/mL is recommended. Compatibility and stability information for the vancomycin and heparin solution is brand specific. Vancomycin 5mg/mL antibiotic locks that do not exceed the dwell time of 24 hours are now prepared in sodium chloride 0.9% only.

1.1 Vancomycin (5mg/mL) and sodium chloride 0.9% antibiotic locks:

**Method for preparation and administration**

1. Reconstitute 500mg vial of Vancomycin with 10mL water for injection (to give concentration of 50mg/mL) – **draw up 1mL (50mg).**

2. Add 1mL (50mg) of Vancomycin to 9mL of sodium chloride 0.9% to give a final concentration of 5mg/mL Vancomycin and a total volume of 10mL. Prepare fresh for each lumen.

3. Instil the required volume for size and type of central venous access device and allow to dwell for up to 24 hours as prescribed by doctor.

4. **Make sure that the line is not flushed during this time by labelling appropriately**

5. Withdraw the volume added to each lumen after dwelling for up to maximum of 24 hours.

6. Document in patient’s medical notes & contact Medical officer if unable to aspirate.

1.2 Vancomycin (5mg/mL) and Citrate (4.67%) antibiotic locks (for haemodialysis patients only)

**Method for preparation and administration**

1. Reconstitute 500mg vial of Vancomycin with 10mL water for injection (to give concentration of 50mg/mL) – **draw up 1mL (50mg).**

2. Draw up 1mL of Trisodium Citrate 46.7% and add to 1mL of Vancomycin 50mg/mL and 8mL of Sodium Chloride 0.9% to give a total volume of 10mL. **This gives a final concentration of 5mg/mL Vancomycin and 4.67% Citrate in a total volume of 10mL.**

3. Prepare fresh for each lumen.

4. Instil the required volume for size and type of central venous access device and allow to dwell for up to 24 hours as prescribed by doctor.

5. **Make sure that the line is not flushed during this time by labelling appropriately**

6. Withdraw the volume added to each lumen after dwelling for up to maximum of 24 hours.

7. Document in patient’s medical notes & contact Medical officer if unable to aspirate.
2. **Gentamicin Lock**

Gentamicin antibiotic lock concentration should be 1mg/mL for most gram negative organisms. Gentamicin in concentrations ≥10mg/mL mixed with heparin results in immediate precipitation.8, 9 Heparin can potentially antagonise the bactericidal properties of gentamicin11, 12. As there is limited compatibility literature with heparin, it is recommended NOT to use heparin in gentamicin locks13. Gentamicin 1mg/mL antibiotic locks that do not exceed the dwell time of 24 hours are now prepared in sodium chloride 0.9% only.

2.1 Gentamicin (1mg/mL) and sodium chloride 0.9% antibiotic locks:

**Method of preparation and administration**

1. Add **0.25mL** (10mg) of 80mg/2mL Gentamicin to **9.75mL** of 0.9% Sodium Chloride to give a final concentration of Gentamicin 1mg/1mL and a total volume of 10mL. Prepare fresh for each lumen.

2. Instil the required volume for size and type of central venous access device and allow to dwell for **up to 24 hours as prescribed by doctor**.

3. **Make sure that the line is not flushed during this time by labelling appropriately**

4. Withdraw the volume added to each lumen after dwelling for up to maximum of 24 hours.

5. Document in patient’s medical notes & contact Medical officer if unable to aspirate.

2.2 Gentamicin (1mg/mL) and Citrate (4.67%) antibiotic locks *(for haemodialysis patients only)*15,16,17,19,20

**Method of preparation and administration**

1. Draw up **0.25mL** (10mg) of Gentamicin 40mg/mL.

2. Draw up **1mL** of Trisodium Citrate 46.7% and add to **0.25mL** Gentamicin 40mg/mL and **8.75mL** of Sodium Chloride 0.9% to give a total volume of 10mL. **This gives a final concentration of Gentamicin 1mg/mL and Citrate 4.67% in a total volume of 10mL.**

3. Prepare fresh for each lumen.

4. Instil the required volume for size and type of central venous access device and allow to dwell **up to 24 hours as prescribed by doctor.**

5. **Make sure that the line is not flushed during this time by labelling appropriately**

6. Withdraw the volume added to each lumen after dwelling for up to maximum of 24 hours.

7. Document in patient’s medical notes & contact Medical officer if unable to aspirate.
3. **Amikacin Lock**

Amikacin antibiotic lock concentration should be 2mg/mL for most gram negative organisms. Heparin can potentially antagonise the bactericidal properties of amikacin\textsuperscript{11, 12}. As there is limited compatibility literature with heparin, it is recommended NOT to use heparin, in amikacin locks\textsuperscript{13}.

3.1 **Amikacin (2mg/mL) and sodium chloride 0.9% antibiotic locks:**

**Method of preparation and administration**

1. Add 0.2mL (50mg) of Amikacin (500mg/2mL vial) to 24.8mL of 0.9% Sodium Chloride to give final concentration of 2mg/mL of Amikacin and a total volume of 25mL. Prepare fresh for each lumen.

2. Instil the required volume for size and type of central venous access device and allow to dwell for \textbf{up to 24 hours as prescribed by doctor}\textsuperscript{13}.

3. **\textit{Make sure that the line is not flushed during this time by labelling appropriately}**

4. Withdraw the volume added to each lumen after dwelling for up to maximum of 24 hours.

5. Document in patient’s medical notes & contact Medical officer if unable to aspirate.
4. **Ampicillin Lock**

Ampicillin antibiotic lock concentration of 10mg/mL is recommended. Compatibility and stability information for the ampicillin and heparin solution is brand specific. Ampicillin 10mg/mL antibiotic locks that do not exceed the dwell time of 24 hours are now prepared in sodium chloride 0.9% only.

4.1 **Ampicillin (10mg/mL) and sodium chloride 0.9% antibiotic locks:**

**Method for preparation and administration**

1. Reconstitute 1000mg vial of Ampicillin with 9.3mL water for injection (powder volume 0.7mL) (to give concentration of 100mg/mL) – **draw up 1mL (100mg).**

2. Add 1mL (100mg) of Ampicillin to 9mL of sodium chloride 0.9% to give a final concentration of 10mg/mL Ampicillin and a total volume of 10mL. Prepare fresh for each lumen.

3. Instil the required volume for size and type of central venous access device and allow to dwell for up to 24 hours as prescribed by doctor.

4. **Make sure that the line is not flushed during this time by labelling appropriately**

5. Withdraw the volume added to each lumen after dwelling for up to maximum of 24 hours.

6. Document in patient’s medical notes & contact Medical officer if unable to aspirate.

5. **Ciprofloxacin Lock**

Ciprofloxacin antibiotic lock concentration of 0.125mg/mL is recommended. Compatibility and stability information for the ciprofloxacin and heparin solution is brand specific. Ciprofloxacin 0.125mg/mL antibiotic locks that do not exceed the dwell time of 24 hours are now prepared in sodium chloride 0.9% only.

5.1 **Ciprofloxacin (0.125mg/mL) and sodium chloride 0.9% antibiotic locks:**

**Method for preparation and administration**

1. Use Ciprofloxacin infusion bag (concentration of 2mg/mL) – **draw up 0.5mL (1mg).**

2. Add 0.5mL (1mg) of Ciprofloxacin to 7.5mL of sodium chloride 0.9% to give a final concentration of 0.125mg/mL Ciprofloxacin and a total volume of 8mL. Prepare fresh for each lumen.

3. Instil the required volume for size and type of central venous access device and allow to dwell for up to 24 hours as prescribed by doctor.

4. **Make sure that the line is not flushed during this time by labelling appropriately**

5. Withdraw the volume added to each lumen after dwelling for up to maximum 24 hours.

6. Document in patient’s medical notes & contact Medical officer if unable to aspirate.
6. Linezolid lock
Linezolid antibiotic lock concentration of 0.2 to 1.92mg/mL is recommended. Compatibility and stability information for the linezolid and heparin solution is brand specific. Linezolid 2mg/mL antibiotic locks that do not exceed the dwell time of 24 hours are now prepared in sodium chloride 0.9% only.

6.1 Linezolid (2mg/mL) and sodium chloride 0.9% antibiotic locks:
Method for preparation and administration
1. Use Linezolid infusion bag (concentration of 2mg/mL) – draw up 4mL (8mg)
2. Add 4mL (8mg) of Linezolid to 4mL of sodium chloride 0.9% to give a final concentration of 1mg/mL Linezolid and a total volume of 8mL. Prepare fresh for each lumen.
3. Instil the required volume for size and type of central venous access device and allow to dwell for up to 24 hours as prescribed by doctor.
4. **Make sure that the line is not flushed during this time by labelling appropriately**
5. Withdraw the volume added to each lumen after dwelling for up to maximum of 24 hours.
6. Document in patient’s medical notes & contact Medical officer if unable to aspirate.

7. Teicoplanin Lock
Teicoplanin antibiotic lock concentration of 2mg/mL is recommended. Compatibility and stability information for the teicoplanin and heparin solution is brand specific. Teicoplanin 2mg/mL antibiotic locks that do not exceed the dwell time of 24 hours are now prepared in sodium chloride 0.9% only.

7.1 Teicoplanin 2mg/mL and sodium chloride 0.9% antibiotic locks:
Method for preparation and administration
1. Reconstitute 400mg vial of Teicoplanin with 3.14mL water for injection (to give concentration of 400mg/3mL) – draw up 0.3mL (40mg).
2. Add 0.3mL (40mg) of Teicoplanin to 19.7mL of sodium chloride 0.9% to give a final concentration of 2mg/mL Teicoplanin and a total volume of 20mL. Prepare fresh for each lumen.
3. Instil the required volume for size and type of central venous access device and allow to dwell for up to 24 hours as prescribed by doctor.
4. **Make sure that the line is not flushed during this time by labelling appropriately**
5. Withdraw the volume added to each lumen after dwelling for up to maximum of 24 hours.
6. Document in patient’s medical notes & contact Medical officer if unable to aspirate.
8. **Cefazolin Lock**

Cefazolin antibiotic lock concentration of 10mg/mL is recommended. Compatibility and stability information for the cefazolin and heparin solution is brand specific. Cefazolin 10mg/mL antibiotic locks that do not exceed the dwell time of 24 hours are now prepared in sodium chloride 0.9% only.

**Method for preparation and administration**

1. Reconstitute 1000mg vial of Cefazolin with 9.5mL water for injection (to give concentration of 100mg/mL) – **draw up 1mL (100mg)**

2. Add 1mL (100mg) of Cefazolin to 9mL of sodium chloride 0.9% to give a final concentration of 10mg/mL Cefazolin and a total volume of 10mL. Prepare fresh for each lumen

3. Instil the required volume for size and type of central venous access device and allow to dwell for up to 24 hours as prescribed by doctor.

4. **Make sure that the line is not flushed during this time by labelling appropriately**

5. Withdraw the volume added to each lumen after dwelling for up to maximum of 24 hours.

6. Document in patient’s medical notes & contact Medical officer if unable to aspirate.
Consultation

Key stakeholders who reviewed this version:
- Dr Julia Clark, Director (Infectious diseases, Immunology and Rheumatology) (LCCH)
- Dr Clare Nourse, Paediatric Infection Specialist (LCCH)
- Tricia Kleidon, Nurse Practitioner, Paediatric Vascular Assessment and Management (LCCH)
- Nicolette Graham, Antimicrobial Stewardship Pharmacist (LCCH)

References and suggested reading

1. Drug Consult Antibiotic Lock therapy for Catheter-related Infection Micromedex 14 March 2012
## Guideline revision and approval history

<table>
<thead>
<tr>
<th>Version No.</th>
<th>Modified by</th>
<th>Amendments authorised by</th>
<th>Approved by</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Antibiotic Lock working group (CHQ) Antimicrobial pharmacist</td>
<td>Medicines Advisory Committee (CHQ)</td>
<td>General Manager Operations</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td>Antimicrobial pharmacist (CHQ) Stewardship</td>
<td>Medicines Advisory Committee (CHQ)</td>
<td>General Manager Operations</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>Antimicrobial pharmacist (CHQ) Stewardship</td>
<td>Medicines Advisory Committee (CHQ)</td>
<td>Executive director Hospital services</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.0</td>
<td>Antimicrobial pharmacist (CHQ) Stewardship</td>
<td>Medicines Advisory Committee (CHQ)</td>
<td>Executive director Hospital services</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Keywords
- antibiotic lock therapy, gentamicin, vancomycin, amikacin, teicoplanin, ciprofloxacin, ceftazidime, cephazolin, linezolid, ciprofloxacin, ampicillin, trisodium citrate, CRBSI, catheter related blood stream infection, long line, haemodialysis catheter

### Accreditation references