UCSF Health

NEONATAL PEDIATRIC NURSING PROCEDURE

ANTIMICROBIAL LOCK THERAPY

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Critical Points

1. Nurses who have reviewed this procedure may administer antimicrobial lock therapy (ALT) to patients following the guidance and steps contained in this procedure.
2. Selection and decision to utilize Antimicrobial Lock Therapy (ALT) - antibiotic or ethanol - should be made in conjunction with Pediatric Infectious Diseases and/or Clinical Pharmacy to ensure proper usage and continuity of care upon discharge.
3. ALT is indicated for documented catheter-related infections and may also be used for prophylaxis in patients with history of central line associated infections.
4. Ethanol lock therapy may be used as an alternative to antibiotic lock based on catheter type and/or organism involved.
5. ALT is not intended for systemic use (i.e., IV infusion or IV push administration).
6. ALT is often used in addition to the same antibiotic given systemically because it achieves high concentrations locally at the desired site of action (i.e., biofilm within catheter lumen).
7. ALT minimum dwell duration preference is 4 hours. A longer duration is desirable to a maximum of 24 hours. ALT may be used to fill additional windows of available time of >/= 4 hours in the catheter lumen(s), dependent on clinical status of patient. Frequency and dwell time should be determined in multidisciplinary discussion that includes bedside nurse. This may be an exception to the CVC heparin flush lock critical point that describes any CVC that must be accessed more than twice in 24 hours is to be maintained as a continuous infusion to avoid multiple entries.
    a. Any lumen that does not have an available minimum of 4 hours for ALT, the infusion going through that lumen should be moved on a 24 hour schedule to allow every lumen to receive ALT (Exception: IV Tacrolimus and CSA must remain in dedicated lumen and this lumen will not receive ALT).

        Example: ALT once or three times daily:

        i. Day 1:
            - Lumen 1: 30 min Cefazolin IV Q8h, ALT Q24h during one or all three 7.5 hour periods of time.
            - Lumen 2: Continuous TPN

        ii. Day 2:
            - Lumen 1: Continuous TPN

Antibiotic and Ethanol Lock Administration *(continued)*

- Lumen 2: 30 min Cefazolin IV Q8h, ALT Q24h during one or all three 7.5 hour periods of time.

8. If a central line has more than one lumen, and regardless of which or how many of the lumens cultured positive, *all* lumens should be treated with ALT unless directed by provider otherwise
9. *Example: Ethanol Lock as per Lexicomp:*
   a. Instill a volume of 70% ethanol equal to the internal lumen volume of the catheter once daily.
   b. Maximum volume: 3 mL.
   c. Typically allow to dwell in lumen for 2 to 4 hours and then aspirate out of catheter.
   d. Preferred dwell time is 4 to 24 hours but shorter dwell time may be necessary due to access issues.
   e. Preference is to instill qday but less frequent dosing (1 to 3 times weekly) may also be acceptable for prophylactic needs.

Antibiotic and Ethanol Lock Administration *(continued)*

Contraindications:

a. Confirmed severe allergy to the ALT.
b. Antibiotic locks containing heparin should not be used in any patients with heparin-induced-thrombocytopenia (HIT).
c. Ethanol locks are not to be used:
    i. In polyurethane (i.e., power) catheters; ethanol locks are only compatible with silicone catheters
    ii. In patients who are pregnant or breastfeeding
    iii. In patients allergic to ethanol
    iv. Concurrently with oral or intravenous metronidazole (within 48 hours), disulfuram (within 7 days), isoniazid (within 24 hours), or any ethanol-containing medication
    v. In patients with unstable hepatic function or hepatic dysfunction
    vi. In patients receiving concurrent heparin or citrate anticoagulant fluid (i.e., CRRT, TPN with heparin) through same catheter; ethanol and heparin/citrate combination may form a precipitate
    vii. In patients with personal or religious exclusion to ingestion of ethanol, discuss risk and benefit to patient and caregiver.

Supplies

- Saline flush syringes
- Disinfection swabs (alcohol or CHG)
- Antimicrobial Lock Therapy Syringe

Procedure

Ordering and Dosing

1. Verify provider order.
2. Medical team to determine the ALT dosing based on type of central line. (See Appendix B). The antibiotic may be mixed with a solution (e.g., heparin or sodium citrate) to maintain lumen patency.

Antibiotic and Ethanol Lock Administration *(continued)*

Administration

1. Verify patient and procedure using two patient identifiers.
2. Perform hand hygiene and don clean gloves.
3. Disinfect injection cap and allow to dry for requisite time period.
4. Attach pre-filled saline syringe and flush CVC with 1-10 mL (follow unit guidelines); remove and discard syringe.
5. Disinfect injection cap and allow to dry for requisite time period.
6. Attach ALT syringe to injection cap.
7. Instill ALT and discard syringe.
8. Clamp catheter and allow ALT to dwell in catheter for ordered amount of time.
9. Place “Do Not Flush” label on lumen with ALT.
10. Document in patient’s medical record which catheter and/or lumen received ALT.

Post- ALT Steps

1. When dwell time complete, aspirate ALT. ALT volume is safe if inadvertently flushed through.
2. Resume IV therapy or flush-lock catheter as per orders.

Caregiver/Patient Education

Educate patient/caregivers on the need for ALT use and goals.

Documentation

Document the ALT in MAR and the lumen it was instilled.

Troubleshooting

Problem	Suspected issue	Action
Continuous IV Tacrolimus or Cyclosporine infusing	• Movement of Tac or CSA to alternate lumen will prevent ability to draw levels from those lumens	• Dedicate lumen to Tac/CSA and that lumen will not receive ALT
Power catheter and desire ethanol lock therapy	• Polyurethane (i.e., power) catheters are not compatible with ethanol locks	• Select alternate ALT; specifically, antibiotic
Very short or no window of time to allow ALT to dwell	• Frequency of IV medications do not allow for ALT dwell time	• Multidisciplinary team to discuss changes in frequency of IV meds, or plan to readdress access availability on a daily basis

Antibiotic and Ethanol Lock Administration *(continued)*

References

Level of Evidence (FAME*)	Level*	Reference
	E4	Jones BA, Hull MA, Richardson DS, et al. Efficacy of ethanol locks in reducing central venous catheter infections in pediatric patients with intestinal failure. *J Pediatr Surg*. 2010;45(6):1287-1293.[PubMed 20620333]
	E4	LexiComp, Alcohol (Ethyl) Pediatric and Neonatal Lexi-Drugs
	E4	Sierra, C.M. Rodriguez, C, Bahjri, K. (2023) Ethanol lock for prevention of CVC-related bloodstream infection in pediatric patients: A systematic review and meta-analysis. *The Journal of Pediatric Pharmacology and Therapeutics,* 28(5), 386-396. https://pmc.ncbi.nlm.nih.gov/articles/PMC10731934/
	E4	Justo, J. A., & Bookstaver, P. B. (2014). Antibiotic lock therapy: review of technique and logistical challenges. *Infection And Drug Resistance*, *7*, 343–363. https://doi.org/10.2147/IDR.S51388
	E4	Bookstaver, P. B., Rokas, K. E., Norris, L. B., Edwards, J. M., & Sherertz, R. J. (2013). Stability and compatibility of antimicrobial lock solutions. *American Journal Of Health-System Pharmacy*, *70*(24), 2185–2198. https://doi.org/10.2146/ajhp120119
	E4	Centers for Disease Control and Prevention. Guidelines for the Prevention of Intravascular Catheter-Related Infections, 2011.

* FAME Scale details: See nursing policy *Policy, Procedure, & Competency Development, Review, & Approval*

Procedure History

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Antibiotic and Ethanol Lock Administration *(continued)*

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Antibiotic and Ethanol Lock Administration *(continued)*

Appendix A: Antibiotic Locks/Prophylactic Antibiotic Lock

Antibiotic Concentration	Anticoagulant concentration
Amphotericin B (liposomal) 2.67 mg/mL	Heparin 66.67 units/mL
Ampicillin 10 mg/mL	Heparin 10 units/mL
Cefazolin 10 mg/mL	Heparin 10 units/mL
Ceftazidime 0.5 mg/mL	Heparin 100 units/mL
Gentamicin 2.4 mg/mL	Sodium Citrate 4%
Linezolid 1 mg/mL	Heparin 10 units/mL
Vancomycin 2 mg/mL	Heparin 10 units/mL

Appendix B: Standardized Volumes for Antibiotic Lock Therapy/Prophylactic Antibiotic Lock

Type of Catheter	**Volume of antibiotic lock to be installed per lumen**
PICC < 2 FR	1 mL
PICC < 2.5 FR	2 mL
Non Tunneled CVC	2 mL
Apheresis catheters	<15 kg: 1mL 15-30 kg: 1.5 mL >30 kg: 2 mL
Tunneled CVC	2 mL
Implanted Port SL	2 mL
Implanted Port DL	Vortex: 2.5 mL BARD: 2 Ml