

Within 24 hours of intravascular catheter insertion, complex matrices, called biofilms, are formed, in which microorganisms are harbored (Figure 1). These microorganisms can detach from the biofilm and seed the bloodstream, causing central line-associated

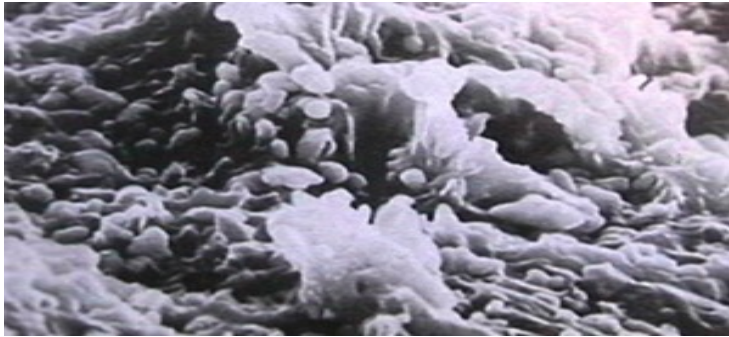


Figure 1. Biofilm on intravascular catheter (Source: www.ivteam.com)

bloodstream infections (CLA-BSIs). Microorganisms within biofilms are more difficult to eradicate with systemic antibiotic therapy due to their sessile nature and biofilm interactions with host immunity. Thus, antibiotic lock therapy [instillation of a highly concentrated antimicrobial solution into the lumen of the catheter for a particular dwell time (refer to Antibiotic Catheter Lock Clinical Pathway at www.nebraskamed.com/asp)] has been advocated as a means to eradicate such organisms. However, a primary concern for the use of antibiotic lock therapy is the potential increased risk of antimicrobial resistance due to the selective pressure caused by antimicrobial exposure.

Ethanol lock therapy (ELT) has been proposed as a potential mechanism to eradicate organisms in biofilms and hence, treat or prevent CLA-BSIs, but decrease the risk of antimicrobial resistance. Additional benefits associated with ELT include the facts that ethanol is readily available and inexpensive.

In vitro data suggest that the integrity of silicone or polyurethane catheters is not clinically significantly affected by exposure to a 70% ethanol solution,¹ although the data are limited regarding different manufacturers and catheter polymers. Thus, before using ELT, the physician should confirm that ethanol is compatible with the catheter polymer (Table 1). Several human clinical studies have demonstrated the efficacy and safety of ELT in adult and pediatric patients for both treatment (in conjunction with systemic antibiotics) and prevention of CLA-BSIs.²⁻⁷ However, these studies are limited by small sample sizes and variability in ELT protocols. No data exist for patients < 3 months old or pregnant/breastfeeding women. Thus, the risk:benefit ratio should be carefully weighed in these situations of limited data and potential for increased risk.

While multiple studies using ELT report very mild or no adverse effects, these studies are limited by retrospective design and/or small sample size.^{2,3,5-7} Side effects reported included tiredness, headaches, dizziness, light-headedness, nausea, and tasting alcohol. Notably, three of the five studies used a protocol whereby the ethanol was flushed through the line rather than aspirated.^{2,3,5} In the studies where the ethanol was withdrawn from the catheter, the only adverse effect reported was the taste of alcohol (n=1).^{6,7} Theoretical ethanol-related toxicities, such as central nervous system depression, arrhythmias, local venous irritation, and flushing, have not been reported in any studies using ELT.

ELT may be considered for patients at The Nebraska Medical Center who meet the following criteria:

1. Require salvage of current intravascular catheter because of inability to place catheter elsewhere
- OR
2. Need to prevent CLA-BSI in a patient with a history of recurrent CLA-BSIs and limited alternatives for intravascular access.

Before beginning ELT, please consult an Infectious Diseases service.

Lock Procedure

Use a 70% ethanol solution. Dwell time for ethanol lock solution should be for a period of at least 4 h daily. Port and lumen identity and volume of solution to be used (usually 1.5-3 mL) must be specified by the physician.

1. Withdraw contents of lumen (ethanol lock solution) and discard.
2. Flush catheter with normal saline.
3. Administer ordered medication through line.
4. Flush catheter with normal saline.
5. Instill volume of ethanol lock solution to fill lumen of catheter.
6. At the conclusion of the lock period, aspirate ethanol lock solution before using line to administer medications.

*****HEPARIN SHOULD NOT BE ADMINISTERED CONCOMITANTLY WITH ELT DUE TO FORMATION OF A PRECIPITATE*****

ELT should NOT be used for peripheral catheters or peripherally-inserted central catheters (PICCs) because of low risk of infection and lack of data, respectively. In pediatric patients and those with underlying liver dysfunction, appropriate consideration should be given to limiting systemic alcohol exposure (i.e., use the appropriate volume to fill the lumen without spillage into the systemic circulation) in order to minimize the potential risk of systemic or hepatic toxicity.

Lock Order

When ordering ELT, please write the following in the Orders section of the medical record:

“70% ethanol ___mL to be locked into _____ (port/CVC & lumen identity) for ___h daily for ___ days. Follow ethanol lock policy.”

Ethanol Lock Recipe

Ingredients needed:

Alcohol 98%, 5ml ampule

Sterile water for injection

1.5ml lock

1. Draw up 1.05mls of alcohol 98%.
2. QS with 0.45ml sterile water for injection.
3. Cap off syringe.

2ml lock

1. Draw up 1.43mls of alcohol 98%.
2. QS with 0.57ml sterile water for injection.
3. Cap off syringe.

3ml lock

1. Draw up 2.1mls of alcohol 98%.
2. QS with 0.9mls of sterile water for injection.
3. Cap off syringe.

References

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4. Sanders J, et al. A prospective double-blind randomized trial comparing intraluminal ethanol with heparinized saline for the prevention of catheter-associated bloodstream infection in immunosuppressed haematology patients. *J Antimicrob Chemother.* 2008;62:809-15.
5. Dannenberg C, et al. Ethanol-lock technique in the treatment of bloodstream infections in pediatric oncology patients with Broviac catheter. *J Pediatr Hematol Oncol.* 2003;25:616-21.
6. Onland W, et al. Ethanol-lock technique for persistent bacteremia of long-term intravascular devices in pediatric patients. *Arch Pediatr Adolesc Med.* 2006;160:1049-53.
7. Broom J, et al. Ethanol lock therapy to treat tunneled central venous catheter-associated blood stream infections: results from a prospective trial. *Scand J Infect Dis.* 2008;40:399-406.

Table 1. Intravascular Catheters in Use at The Nebraska Medical Center and Compatibility with Ethanol

NOTE: If ethanol lock therapy is desired for a catheter that is not on this list, contact the manufacturer to ensure compatibility.

Catheter	Polymer	Compatible with ≥70% Ethanol?
AngioDynamics & Horizon Medical Products		
Dialysis Even More Flow catheter kit	Carbothane	No
DuraFlow dialysis kit	Carbothane	No
DuraFlow straight basic 24 cm hemodialysis kit	Carbothane	No
Port Smart CT 9.6 Fr outer diameter detached silicone catheter	Silicone	No
Triple lumen apheresis CV-332	Polyurethane	No
Arrow International		
9 Fr Central venous access kit two lumen used w/7.5-8 Fr	Polyurethane	No
Central venous catheter SGL 7 Fr 16cm PU SS-14701	Polyurethane	No
Double lumen 7 Fr CVP catheter	Polyurethane	No
Tray – Central venous 18g catheter single lumen over 20g intro scalpel 18g extra thin 4.8 Fr 80cm	Polyurethane	No
Triple lumen 7 Fr 20cm catheter AK-15703-CDC	Polyurethane	No
Triple lumen catheter kit 5.5 Fr 13cm	Polyurethane	No
Triple lumen catheter 7 Fr 30cm (LX)	Polyurethane	No
Triple lumen central venous catheter 7 Fr X 18g	Polyurethane	No
Triple lumen pedi catheter 5.5 Fr 8cm	Polyurethane	No
Bard		
Abramson triple lumen 15mm diameter 15in length drain sump, latex free w/filter	Polyurethane	No
Bard dual lumen port 9.5 Fr	Silicone	Yes
Broviac 6.6 Fr single lumen ingrowth cuff w/ peel stilet	Silicone	Yes

Broviac catheter single lumen 2.7 Fr single lumen ingrowth cuff	Silicone	Yes
Broviac catheter single lumen 4.2 Fr Ped	Silicone	Yes
Chronic femoral hemodialysis catheter 16 Fr 27cm	Polyurethane	No
Groshong catheter single lumen 8 Fr ingrowth/1 antimicrobial cuff	Silicone	Yes
Groshong port 7.0 Fr single lumen	Silicone	Yes
Hemosplit long term hemodialysis catheter 16 Fr 19cm	Polyurethane	No
Hemosplit long term hemodialysis catheter 16 Fr 23cm	Polyurethane	No
Hemosplit long term hemodialysis catheter 16 Fr 27cm	Polyurethane	No
Hickman catheter 9 Fr	Silicone	Yes
Hickman catheter 9.6 Fr single lumen ingrowth/4 antimicrobial cuff	Silicone	Yes
Hickman 13.5 x 36 x 19 chronic hemodialysis double lumen	Silicone	Yes
Hickman catheter 13.5 x 40 x 23 hemodialysis dual lumen	Silicone	Yes
Hickman catheter 13.5 x 45 x 28 chronic dual hemodialysis straight antimicrobial cuff	Silicone	Yes
Hickman catheter 13.5 x 50 x 33 hemodialysis tray chronic dual straight antimicrobial cuff	Silicone	Yes
Hickman catheter dual lumen 7 Fr	Silicone	Yes
Hickman DL 12 Fr 0600620	Silicone	Yes
Hickman triple lumen 12 Fr peel apart introducer kit	Silicone	Yes
Infusi-Port implantable access port	Polyurethane	No
ISP MRI port with 6 Fr attachable Chronoflex catheter	Polyurethane	No
MRI infusion port 9.6 Fr ATT open ended peel apart introducer	Silicone	Yes
Port Power 8 Fr Chronoflex	Silicone/polyurethane	No
Port Power MRI device w/ 8 Fr Chronoflex catheter	Polyurethane	No
Port Power MRI device w/ 8 Fr polyurethane catheter	Polyurethane	No
Single MRI infusion port 9.6 Fr pre-att open ended	Silicone	Yes
Slim Port dual catheter 7 Fr	Silicone	Yes
Vitacuff dialysis catheter 60cm	Silicone	Yes
Cook Group Incorporation		
Arterial femoral 3 Fr x 8cm single lumen pedi central line	Polyurethane	Yes
Double lumen central venous catheter 4 Fr	Polyurethane	No
Double lumen pedi 5 Fr catheter	Polyurethane	Yes
Peritoneal dialysis kit 8.5 Fr x 8cm	Polyurethane	Yes
Tray – single lumen central venous catheter 3 Fr 8cm	Silicone	Yes
Edwards Lifesciences		
Triple lumen CVC w/oximetry kit	Polyvinyl chloride	No
Kendall Company		
Femoral dialysis catheter 11.5 Fr	Carbothane	Unknown
Mahurkar 13cm triple lumen catheter	Carbothane/silicone	Unknown
Mahurkar 16cm triple lumen catheter	Carbothane/silicone	Unknown
Mahurkar 20cm triple lumen catheter	Carbothane/silicone	Unknown
Mahurkar 24cm triple lumen catheter	Carbothane/silicone	Unknown
Peritoneal dialysis catheter 62cm	Silicone	Unknown
Medcomp		
Hemodialysis catheter 8 Fr x 24cm	Silicone	Yes
Hemodialysis double lumen catheter set 12.5 Fr x 28cm	Silicone	Yes
Hemodialysis double lumen catheter set 12.5 Fr x 32cm	Silicone	Yes
Navilyst Medical		
Chest port 45-215	Polyurethane	Unknown
Port CT compatible 8 Fr 2.6mm OD 1.6mm ID 75cm length plastic power injectable	Polyurethane	Unknown
Vaxcel chest port 7 Fr	Polyurethane	Unknown
Vaxcel chest port 9 Fr	Polyurethane	Unknown
Vaxcel dialysis catheter 15 Fr x 23cm	Carbothane	Unknown
Vaxcel dialysis catheter 14 Fr x 19cm	Carbothane	Unknown
Vaxcel dialysis catheter 14 Fr x 28cm	Carbothane	Unknown
Sims Portex		

Portacath 8.4 Fr 76cm single lumen 21-4055	Polyurethane	No
Portacath II 6 Fr single lumen 21-4083-01 low profile	Polyurethane	No
Portacath II 8.5 Fr single lumen 21-4071 low profile	Polyurethane	No
Spire Biomedical		
Alta Gold tunneled catheter	Carbothane/polyurethane	Unknown
Decathlon Gold dialysis catheter 28cm	Carbothane/polyurethane	Unknown
Decathlon Gold dialysis catheter 32cm	Carbothane/polyurethane	Unknown
Double lumen dialysis catheter 24 Fr 19cm	Silicone	Unknown
Double lumen dialysis catheter 28 Fr 23cm	Silicone	Unknown
Double lumen dialysis catheter 32 Fr 27cm	Silicone	Unknown
Double lumen dialysis catheter 36 Fr 31cm	Silicone	Unknown

Table created July 2009 based on information provided by manufacturers.