The Optimal Ethanol Lock Therapy Regimen for the Treatment of Biofilm-Associated Catheter Infections: Results From an In Vitro Study

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Catheter-related bloodstream infection (C-RBSI) is a major nosocomial infection\textsuperscript{1,2}.

C-RBSI rates range from 2 to 5 episodes/1,000 catheter days\textsuperscript{1,6}.

Clinical impact
- Attributable mortality rate: 10-15\%\textsuperscript{3}.
- Extra days of hospitalization: 15-25\textsuperscript{3,4}.
- Associated costs: 18,000€ (Spain)-50,000$ (USA)\textsuperscript{3,5}.

\textsuperscript{1} Mermel et al. Clin Infect Dis 2009.
Guidelines recommend **catheter withdrawal** when there is suspicion of C-RBSI (A-II)\(^1\).

When catheter is essential, the combination of **systemic** antimicrobials with antimicrobial **lock therapy** is recommended (B-II)\(^1\).

Long-term CVCs infection is mainly associated with intraluminal colonization

\(^1\) Mermel et al. Clin Infect Dis 2009
Alternatively, antiseptic lock solutions are being used.

Although ethanol lock therapy (ELT) solutions have been widely tested as a profilactic approach in specific populations, it has not proven useful\(^1,2,3,4\).

In contrast, use of ELT for the treatment of C-RBSI is promising\(^5\).

However, there are not enough data to recommend ELT as a therapeutic solution (C-III).

There is no clear consensus on the optimal regimen. In addition, findings on efficacy, concentration, use of anticoagulants, and adverse effects are controversial\(^6,7,8\).
OBJECTIVE

To test different combinations of ethanol lock solutions and heparin in an in vitro model in order to find the most suitable ethanol lock therapy (ELT) regimen using the minimum concentration of the components to eradicate biofilms produced by various microorganisms.
**MATERIAL AND METHODS**

**24-h biofilm**

- **Staphylococcus aureus ATCC25923**
- **Staphylococcus epidermidis** (clinical strain)
- **Enterococcus faecalis ATCC33186**
- **Escherichia coli ATCC25922**
- **Candida albicans ATCC14058**

**XTT assay**
(absorbance at 490 nm in spectrophotometer)

**270 experiments**

- **Heparin activity**
  (Anti-Xa assay)

**Reduction in metabolic activity (%)**

**Inhibition of re-growth at 24 h (%)**

*Only for the best regimen detected*

**Efficacy** was defined as ≥90% reduction in metabolic activity or inhibition of re-growth.
Median Reduction of metabolic activity (%)

RESULTS
RESULTS

Median inhibition of re-growth at 24 h (%) by species

- **Staphylococcus aureus ATCC25923**
- **Staphylococcus epidermidis** (clinical strain)
- **Enterococcus faecalis ATCC33186**
- **Escherichia coli ATCC25922**
- **Candida albicans ATCC14058**
ELT solutions: 40% ethanol + 60 IU heparin, maintained ≥24 hours, 3-day course of therapy

Future studies: optimize and increase ethanol penetration and activity for complete eradication

Assess evaluation of the efficacy of ELT in the clinical setting
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