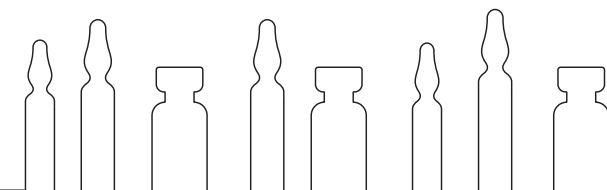


Catheter Lock-Solutions in Dialysis

	Anticoagulative Effectiveness, Patency	Thrombolytic Effectiveness	Antibacterial Effectiveness	Antifungal Effectiveness	Inhibition of Biofilm-Formation	Removal of Biofilm	Catheter Survival	Low Risk of Resistencies	Tolerability
TauroLock™	✓ ^{2,11}	○	✓ ^{1,2,3,8,9}	✓ ^{12,14,16}	✓ ²	✓ ³⁴	✓ ¹	✓ ¹⁵	✓ ^{19,30,31,8,2,24}
TauroLock™-HEP500	✓ ³	○	✓ ^{2,5,6,7}	✓ ^{12,14,16}	✓ ³	✓ ³⁴	✓ ³	✓ ¹⁵	✓ ^{19,30,31}
TauroLock™-U25.000	✓ ^{4,5}	✓ ^{4,5}	✓ ⁵	✓ ^{12,14,16}	✓ ^{4,5}	✓ ^{34,35}	✓ ^{4,5}	✓ ¹⁵	✓ ^{19,30,31}
Heparin 5000 IU/ml	✓	○	✗ ^{18,29}	✗	✗	✗	○	✓	✗
4% Citrate	✓ ^{11,22,23}	○	○ ^{11,18,22,23}	○ ¹⁸	✗ ^{11,22,23}	○	○	✓	✓ ^{19,30,31,8}
30% Citrate	✗ ^{19,25,28}	○	○ ^{25,28}	○ ¹⁸	✗ ^{18,19,25,28}	✗	✗	✓	✗ ^{19,20}
46.7% Citrate	✗ ^{19,26,27}	○	○ ^{27,26}	○	✗ ^{19,26,27}	✗ ³⁴	✗	✓	✗ ^{19,21,31}
Antibiotics	○	○	✓	○ ¹⁸	✓	○	✗	✗ ^{32,33}	✗ ³²

NutriLock™ and TauroSept® are not recommended for dialysis catheters due to lack of anticoagulative effectiveness.^{10,13,15,16,17}

✓ positive Impact
 ○ without Impact
 ✗ negative Impact



References:

- 1 Allon M. Prophylaxis Against Dialysis Catheter-Related Bacteremia With a Novel Antimicrobial Lock Solution. *Clin Infect Dis*. 2003 Jun 15;36(12):1539-44.
- 2 Betjes MG, van Agteren M. Prevention of dialysis catheter-related sepsis with a citrate-taurolidine-containing lock solution. *Nephrol Dial Transplant*. 2004 Jun;19(6):1546-51.
- 3 Solomon LR, Cheesbrough JS, Bhargava R, Mitsides N, Heap M, Green G, Diggle P. Observational study of need for thrombolytic therapy and incidence of bacteremia using taurolidine-citrate-heparin, taurolidine-citrate and heparin catheter locks in patients treated with hemodialysis. *Semin Dial*. 2012 Mar-Apr;25(2):233-8.
- 4 Al-Ali F, Hamdy AF, Hamad A, Elsayed M, Iqbal Z, Elsayed A, Ibrahim R, Tolba H, Buanan H, Fawzy A. Safety and Efficacy of Taurolidine/Urokinase Versus Taurolidine/Heparin as a Tunneled Catheter Lock Solution in Hemodialysis Patients: A Prospective, Randomized, Controlled Study *Nephrol Dial Transplant*. 2018 Apr 1;33(4):619-626.
- 5 Winnicki W, Herkner H, Lorenz M, Handisurya A, Kikić Ž, Bieleśz B, Schairer B, Reiter T, Eskandary F, Sunder-Plassmann G, Sengoelge G. Taurolidine-based catheter lock regimen significantly reduces overall costs, infection, and dysfunction rates of tunneled hemodialysis catheters. *Kidney Int*. 2018 Mar;93(3):753-760.
- 6 Murray EC, Deighan C, Geddes C, Thomson PC. Taurolidine-citrate-heparin catheter lock solution reduces staphylococcal bacteraemia rates in haemodialysis patients. *QJM*. 2014 Dec;107(12):995-1000.
- 7 Fontseré N, Cardozo C, Donate J, Soriano A, Muros M, Pons M, Mensa J, Campistol JM, Navarro-González JF, Maduell F. Tunneled catheters with taurolidine-citrate-heparin lock solution significantly improve the inflammatory profile of hemodialysis patients. *Antimicrob Agents Chemother*. 2014 Jul;58(7):4180-4.
- 8 Dümichen MJ, Seeger K, Lode HN, Kühl JS, Ebell W, Degenhardt P, Singer M, Geffers C, Querfeld U. Randomized controlled trial of taurolidine citrate versus heparin as catheter lock solution in paediatric patients with haematological malignancies. *J Hosp Infect*. 2012 Apr;80(4):304-9.
- 9 Łyszkowska M, Kowalewski G, Szymczak M, Polnik D, Mikołajczyk A, Kaliciński P. Effects of Prophylactic Use of Taurolidine-Citrate Lock on the Number of Catheter-Related Infections in Children Under 2 Years of Age Undergoing Surgery. *J Hosp Infect*. 2019 Oct;103(2):223-226.
- 10 Wouters Y, Roosenboom B, Causevic E, Kievit W, Groenewoud H, Wanten G. Clinical Outcomes of Home Parenteral Nutrition Patients Using Taurolidine as Catheter Lock: A Long-Term Cohort Study. *Clin Nutr*. 2019 Oct;38(5):2210-2218.
- 11 Zhao Y, Li Z, Zhang L, Yang J, Yang Y, Tang Y, Fu P. Citrate versus heparin lock for hemodialysis catheters: a systematic review and meta-analysis of randomized controlled trials. *Am J Kidney Dis*. 2014 Mar;63(3):479-90.
- 12 Diamanti A, Capriati T. Recurrent catheter related bloodstream infections by *Candida glabrata*: Successful treatment with taurolidine. *Clinical Nutrition* 33 (2014) 367.
- 13 Olthof E.D. Rentenaar R.J. Rijs A.J.M.M. Wanten G.J.A. Absence of microbial adaptation to taurolidine in patients on home parenteral nutrition who develop catheter related bloodstream infections and use taurolidine locks. *Clin Nutr*. 2013; 32: 538-542.
- 14 Chu H-P, Brind J, Tomar R, Hill S. Significant Reduction in Central Venous Catheter-related Bloodstream Infections in Children on HPN After Starting Treatment With Taurolidine Line Lock. *JPGN* 2012;55: 403–407.
- 15 Torres-Viera C, Thauvin-Eliopoulos C, Wennerstein CB, Souli M, Sofia RD, Eliopoulos GM. Activities of taurolidine in vitro and in experimental enterococcal endocarditis. *Antimicrob Agents Chemother* 2000; 44(6): 1720-4.
- 16 Gorman, SP, McCafferty DF, et al. (1987). Reduced adherence of micro-organisms to human mucosal epithelial cells following treatment with Taurolin, a novel antimicrobial agent. *J Appl Bacteriol* 62(4): 315–20.
- 17 Reinmüller J. The influence of taurolidine on physiological and pathological blood coagulation and implications for its use. *Zentralbl Chir* 1999;124 Suppl 4: 13–8.
- 18 Weijmer MC, Debets-Ossenkopp YJ, Van De Vondervoort FJ, ter Wee PM. Superior Antimicrobial Activity of Trisodium Citrate Over Heparin for Catheter Locking. *Nephrol Dial Transplant*. 2002 Dec;17(12):2189-95.
- 19 Schilcher G, Scharnagl H, Horina JH, Ribitsch W, Rosenkranz AR, Stojakovic T, Polaschegg H-D. Trisodium Citrate Induced Protein Precipitation in Haemodialysis Catheters Might Cause Pulmonary Embolism. *Nephrol Dial Transplant*. 2012 Jul;27(7):2953-7.
- 20 Punt CD, Boer WE. Cardiac Arrest Following Injection of Concentrated Trisodium Citrate. *Clin Nephrol*. 2008 Apr;69(4):317-8.
- 21 Willicombe MK, Vernon K, Davenport A. Embolic Complications From Central Venous Hemodialysis Catheters Used With Hypertonic Citrate Locking Solution. *Am J Kidney Dis*. 2010 Feb;55(2):348-51.
- 22 Macrae JM, Dojcinovic I, Djurdjev O, Jung B, Shalansky S, Levin A, Kiaii M. Citrate 4% versus heparin and the reduction of thrombosis study (CHARTS). *Clin J Am Soc Nephrol*. 2008 Mar;3(2):369-74.
- 23 Grudzinski L, Quinan P, Kwok S, Pierratos A. Sodium Citrate 4% Locking Solution for Central Venous Dialysis Catheters--An Effective, More Cost-Efficient Alternative to Heparin. *Nephrol Dial Transplant*. 2007 Feb;22(2):471-8.
- 24 Shedin S, Bong YC, Okano S, Chatfield MD, Walsham J. A prospective observational study of the change in systemic ionised calcium following 4% citrate locking of venous haemodialysis catheters in intensive care patients. *Anaesth Intensive Care* 2018 | 46:4
- 25 Weijmer MC, van den Dorpel MA, Van de Ven PJ, ter Wee PM, van Geelen JA, Groeneveld JO, van Jaarsveld BC, Koopmans MG, le Poole CY, Schrande-Van der Meer AM, Siebert CE, Stas KJ; CITRATE Study Group. Randomized, clinical trial comparison of trisodium citrate 30% and heparin as catheter-locking solution in hemodialysis patients. *J Am Soc Nephrol*. 2005 Sep;16(9):2769-77.
- 26 Winnett G, Nolan J, Miller M, Ashman N. Trisodium Citrate 46.7% Selectively and Safely Reduces Staphylococcal Catheter-Related Bacteraemia. *Nephrol Dial Transplant*. 2008 Nov;23(11):3592-8.
- 27 Power A, Duncan N, Singh SK, Brown W, Dalby E, Edwards C, Lynch K, Prout V, Cairns T, Griffith M, McLean A, Palmer A, Taube D. Sodium citrate versus heparin catheter locks for cuffed central venous catheters: a single-center randomized controlled trial. *Am J Kidney Dis*. 2009 Jun;53(6):1034-41.
- 28 Correa Barcellos F, Pereira Nunes B, Jorge Valle L, Lopes T, Orlando B, Scherer C, Nunes M, Araújo Duarte G, Böhlke M. Comparative effectiveness of 30 % trisodium citrate and heparin lock solution in preventing infection and dysfunction of hemodialysis catheters: a randomized controlled trial (CITRIM trial). *Infection*. 2017 Apr;45(2):139-145.
- 29 Sun Y, Wan G, Liang L. Taurolidine lock solution for catheter-related bloodstream infections in pediatric patients: A meta-analysis. *PLoS One*. 2020; 15(4): e0231110.
- 30 Vanholder R, Canaud B, Fluck R, Jadoul M, Labriola L, Marti-Monros A, Tordoir J, Van Biesen W. Diagnosis, prevention and treatment of haemodialysis catheter-related bloodstream infections (CRBSI): a position statement of European Renal Best Practice (ERBP). *NDT Plus*. 2010 Jun;3(3):234-246.
- 31 FDA Talk Paper (Apr) 16:4-14-2000.
- 32 Landry D, Braden G. Reducing catheter-related infections in hemodialysis patients. *Clin J Am Soc Nephrol*. 2014 Jul;9(7):1156-9.
- 33 Bueloni TNV, Marchi D, Caetano C, de Souza Cavalcante R, Amaral MLA, Ponce D. Cefazolin-gentamicin versus taurolidine-citrate for the prevention of infection in tunneled central catheters in hemodialysis patients: A quasi-experimental trial. *International Journal of Infectious Diseases* 85 (2019) 16–21.
- 34 Hogan S, Zapotoczna M, Stevens NT, Humphreys H, O'Gara JP, O'Neill E. In Vitro Approach for Identification of the Most Effective Agents for Antimicrobial Lock Therapy in the Treatment of Intravascular Catheter-Related Infections Caused by *Staphylococcus aureus*. *Antimicrob Agents Chemother* 2016;60(5):2923-2931.
- 35 Jiménez Hernández M, Soriano A, Filella X, Calvo M, Coll E, Rebled JM, Poch E, Graterol F, Compte MT, Maduell F, Fontseré N. Impact of locking solutions on conditioning biofilm formation in tunneled haemodialysis catheters and inflammatory response activation. *J Vasc Access*. 2020 Jul 21; doi: 10.1177/1129729820942040.