

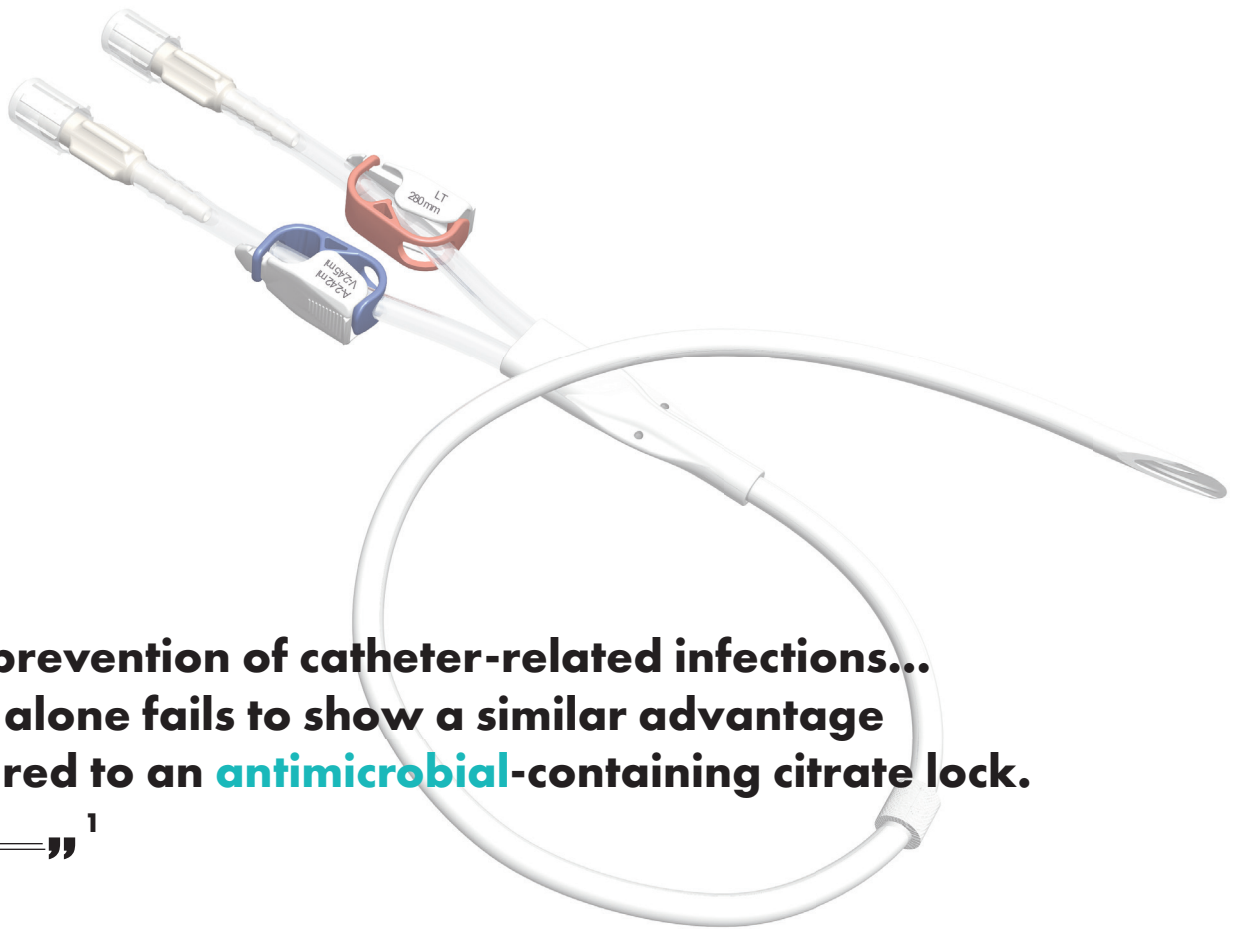
Taurolidine-Citrate-Heparin the superior lock solution

Clinical Evidence
for central venous catheters in **haemodialysis**

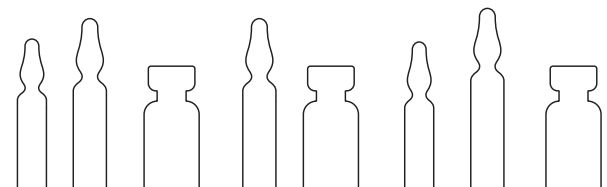


Introduction

Catheter-related infections and dysfunction are the main catheter complications causing morbidity and mortality in haemodialysis patients. Over the years, many lock solutions - often based on sodium citrate - have been discussed as best alternative to 5.000 IU/mL Heparin. Suppliers of 4% Citrate containing lock solutions even claim it is antimicrobial. However, there is no supporting clinical evidence.



“
**In the prevention of catheter-related infections...
citrate alone fails to show a similar advantage
compared to an antimicrobial-containing citrate lock.**
”¹



Expert Recommendations

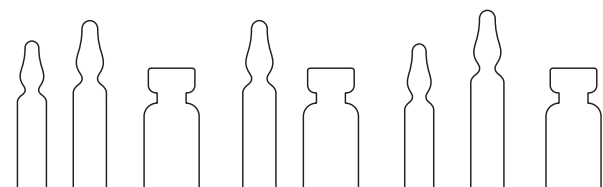
According to the European Renal Best Practice (ERBP 2010), in two studies (McRae, Grudzinski), no benefit regarding infectious complications had been observed for 4% citrate. ^{2,3}

4% Citrate vs Heparin ³		
	Heparin 5000 IU/ml	4% sodium citrate
CRBSI rate per 1.000 catheter days	3.3	2.2
Not significant		

Antibacterial lock solutions should ... be preferred. ... taurolidine-citrate solutions can be used.⁴

Taurolidine-Citrate vs Heparin ⁴		
	Heparin 5000 IU/ml	Taurolidine + 4% Sodium Citrate
CRBSI rate per 1.000 catheter days	5.6	decreased by about 90%
Bacteremia-free survival at 90 days (p<0.001)	47%	94%

“
Allon recommended in 2003: Because of a number of incidences of clotting, the possibility of adding Heparin to the Taurolidine/Citrate as soon as the catheter is inserted, should be investigated.
 ”⁵



Taurolidine - the solution is in the combination

In 2012: Solomon confirmed „...the addition of 500 IU/ml of Heparin to Taurolidine-Citrate may achieve patency comparable to Heparin 5000 U/ml.“ ⁶

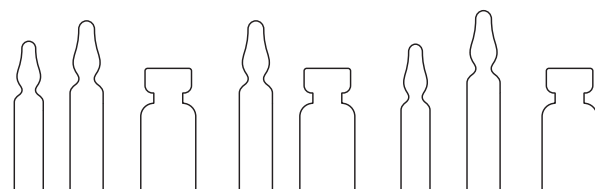
“
**The most promising results are obtained when
 antibacterial compounds are added to citrate or heparin.**

”⁷



TauroLock™ HEP 500

TauroLock™-Hep500 contains the antimicrobial compound Taurolidine, 4% sodium citrate and 500 IU/ml Heparin.



Additional benefits of Urokinase

The utilisation of TauroLock™-Hep500 as an antimicrobial lock solution in dialysis has shown a significant reduction of catheter related bloodstream infections (CRBSI) in many different studies.^{8,9,10}

Even better results are achieved with the so called **2+1 protocol**:


Twice per week TauroLock™-Hep500 and once per week TauroLock™-U25.000.

		TauroLock™ HEP 500	2+1 protocol <small>TauroLock™ HEP 500 TauroLock™ U25.000</small>
CVC exchanges	due to thrombosis and infection	7	1
Patency	rt-PA consumption per 1.000 catheter days	4.3	2.1
Infection	CRBSI per 1.000 catheter days	0.3	0.08

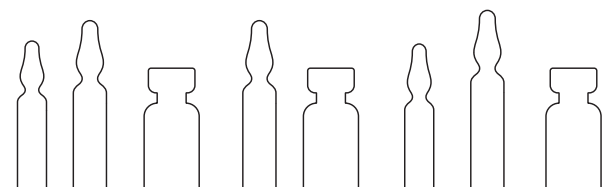
 Study authors: Al-Ali, F. et al. ¹¹

 Study location: Qatar  Patients enrolled: 164

 Journal and publication date: Nephrology Dialysis Transplantation (ndt), 2017

 Keynotes: "Taurolock™-U25.000 is a safe and effective tunnelled dialysis catheter lock solution, with low rate of catheter exchange."

"No reported serious adverse event or bleeding related to the lock solution was encountered during the study period in either group."



Expert recommendations

The German guideline of infection prevention and hygiene and the US dialysis guideline (KDOQI) recommend urokinase for the prophylactic use in central venous catheters.

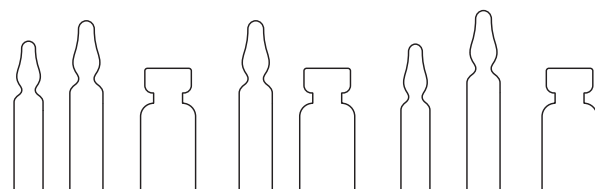
“
...Urokinase with or without taurolidine is a reasonable option for overproportional rates of bloodstream infections.
 ”¹²



TauroLock™ U25.000

TauroLock™-U25.000 contains the antimicrobial compound Taurolidine, 4% Citrate and Urokinase (25.000 IU).






TauroLock™-U25.000 fulfills the above mentioned guideline recommendations and contains Urokinase to ensure patency and provides infection control in the device.



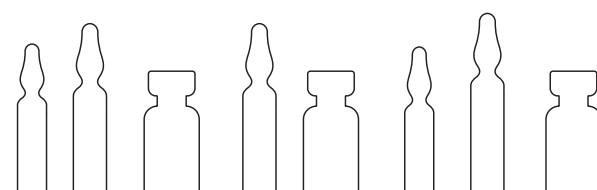
Best practice & cost efficiency

Clinical outcomes		Sodium Citrate 4%	2+1 protocol <small>TauroLock HEP TauroLock</small>	p value
Patency	catheter dysfunction per 1.000 catheter days	44.3	18.7	p = 0.001
	rt-PA Rate per 1.000 catheter days	9.8	3.8	p = 0.001
Bloodstream Infection	CRI per 1.000 catheter days	2.7	0.67	p = 0.003
Hospitalisation	CRI events in days	15.8	3.7	p = 0.001

Costs per year	Sodium Citrate 4%	2+1 protocol <small>TauroLock HEP TauroLock</small>
costs of lock solution (purchase accumulated)	187.- USD	1.485.- USD
Costs for complication management (dysfunction, CRI)	4.309.- USD	1.063.- USD
Use of alteplase included!	→ 43 % cost savings	

-  Study authors: Winnicki, W. et al. ¹³
-  Study location: Vienna, Austria  Patients enrolled: 106
-  Journal and publication date: Kidney International, 2017
-  Keynotes: "significant catheter-related cost savings of 43% in the taurolidine group vs. citrate group when overall expenses per patient and year were compared"

"use of taurolidine-based catheter lock solutions containing heparin and urokinase significantly reduced complications related to tunneled hemodialysis catheters when compared to four percent citrate solution and was overall more cost-efficient"



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- ⁴ **Dialysis standard 2016, German Society of Nephrology in cooperation with the Association of German Kidney Centers as well as the Society of Paediatric Nephrology**
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Guideline for infection prevention
- ¹² **Guideline for infection prevention and hygiene 2019 in addition to the dialysis standard.**
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- ¹³ **Taurolidine-based catheter lock regimen significantly reduces overall costs, infection, and dysfunction rates of tunneled hemodialysis catheters.**
Winnicki W, Herkner H, Lorenz M, Handisurya A, Kikic Z, Bielez B, Schairer B, Reiter T, Eskandary F, Sunder-Plassmann G, Sengoelge G. Kidney Int 2017: S0085-2538(17)30495-7.

