Central venous catheters (CVC) are used as short or long term vascular access devices in hemodialysis, oncology, ICU and total parenteral nutrition. They are commonly applied as tunnelled subcutaneous access devices. These mono- or dual-lumen catheters are also compatible with titanium port systems.

Blood Stream Infections (CRBSI)

Catheter related infections may develop septic symptoms which require the immediate removal of the catheter. A systemic antibiotic treatment to salvage the catheter is mostly not successful due to the lack of considerable inhibiting concentrations of the antibiotic.

Catheter related bacteraemia is a common complication of all central venous catheters with an incidence of 3–9 episodes per 1000 catheter days.

Preventive measures are essential to manage this major complication. The prophylactic use of antibiotics is not recommended because of the resistance development of micro-organisms and the corresponding side-effects (ototoxicity of gentamicin).


Preventing infections of central venous catheters with a taurolidine/citrate solution; O. Kramenko, Western Galilee Hospital, Nahariya, Israel, Presentation at British Renal 2006, Harrogate P205 (RA6432).


Preparation of an antibacterial solution to prevent catheter-related bloodstream infection in long-term parenteral nutrition patients; A. Simon et al, BMC Infectious Diseases, 2008, 8:102.

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Preparation of an antibacterial solution to prevent catheter-related bloodstream infection in long-term parenteral nutrition patients; A. Simon et al, BMC Infectious Diseases, 2008, 8:102.
Prophylaxis against catheter related bloodstream infections:

Central venous catheters (CVC) are used as short or long term vascular access devices in hemodialysis, oncology, ICU and total parenteral nutrition. High risks for CVC malfunction are catheter related infections (CRI). These infections may be triggered by microbial colonization of the catheter and the microorganisms can spread from here to the bloodstream. CRI may develop septic symptoms which require the immediate removal of the catheter.

TauroLock™ catheter lock solutions do not contain antibiotics and were developed for prophylactic use. They reduce catheter related infections significantly (~ 90%).

The combination of citrate (4%) with (cyclo)-taurolidine and heparin/urokinase has excellent anticoagulative and antimicrobial properties also against resistant microorganisms like MRSA und VRE.

Therefore TauroLock™ is recommended in different guidelines (see ref. A.) such as the Hygiene Guidelines completing the German Dialysis Standard, the evidence-based recommendations of the German Society for Paediatric Oncology and Hematology (GPOH) and the hygiene guidelines of the University of Bonn (Germany).

(Cyclo)-Taurolidin prevents catheter infections:

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<thead>
<tr>
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<th>DIALYSIS</th>
<th>ONCOLOGY/PARENTERAL NUTRITION</th>
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<tbody>
<tr>
<td>Cansad</td>
<td>4.3</td>
<td>4.2</td>
</tr>
<tr>
<td>Ditmer</td>
<td>6.5</td>
<td>1.6</td>
</tr>
<tr>
<td>Sodemann</td>
<td>0.2</td>
<td>10.0</td>
</tr>
<tr>
<td>Alken</td>
<td>0.5</td>
<td>8.0</td>
</tr>
<tr>
<td>Beljes</td>
<td>2.1</td>
<td>2.0</td>
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<tr>
<td>Yerven</td>
<td>0.0</td>
<td>8.0</td>
</tr>
<tr>
<td>Kramenka</td>
<td>2.5</td>
<td>1.5</td>
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<tr>
<td>Taylor</td>
<td>0.8</td>
<td>0.6</td>
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</tbody>
</table>

TauroLock™ is safe:

The concentration of 4% citrate in TauroLock™ is according to the recommendation of the FDA, dated from April 2000, safe and efficient (ref.: FDA Warning Letter, April 2000).

No hypocalcemic effects due to high concentrated citrate solutions (30% resp. 46,7%), e.g. arrhythmia, cardiac arrest*, emboli**, tingling in the fingers and metallic taste observed***.

TauroLock™ is biocompatible and non toxic.

TauroLock™ is bactericidal and fungicidal within 2 hours:

**Legend**

- S. aureus (MRSA)
- P. aeruginosa
- A. niger
- E. coli
- C. albicans
- S. epidermidis

* detection limit (10 cfu/ml)

Clearly superior in comparison to the activity of Citrate and Heparin:

If used prophylactically, TauroLock™ prevents the development of a biofilm on the surface of the catheter lumen:

Heparin Lock – 7 months implanted – S. epidermidis biofilm covers surface completely

TauroLock™ 5 months implanted – No colonization
TauroLock™ catheter lock solutions are available in different containers:

<table>
<thead>
<tr>
<th>Produkt</th>
<th>TauroLock</th>
<th>TauroLock</th>
<th>TauroLock</th>
<th>TauroLock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ampoule (10 x 5 mL)</td>
<td></td>
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<tr>
<td>Ampoule (5 x 3 mL)</td>
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<tr>
<td>Vial (100 x 10 mL)</td>
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<tr>
<td>Vial (5 x 5 mL)</td>
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</tbody>
</table>

Instillation of TauroLock™

1. Flush the device with 10 mL of saline.
2. Withdraw TauroLock™ from the container using an appropriate syringe.
3. Instill TauroLock™ slowly (not more than 1 mL per second, infants not more than 1 mL per 5 second) into the access device in a quantity sufficient to fill the lumen completely. Consult the manufacturer’s instructions for the specific fill volume or specify fill volume during implantation. The volume has to be strictly respected. TauroLock™ will remain inside the access device until the next treatment.
4. If aspiration of TauroLock™ is needed and possible, it should be withdrawn from the port/catheter and discarded prior to initiation of next treatment.
5. Flush the device with 10 mL of saline.

Ordering information: TauroLock™ catheter lock solutions are delivered in boxes containing 5 ampoules (3 mL), 10 ampoules (5 mL) or in boxes containing 100 vials (10 mL).
Prevention of Catheter Related Blood Stream Infections (CRBSI)

Central venous catheters (CVC) are used as short or long term vascular access devices in hemodialysis, oncology, ICU and total parenteral nutrition. They are commonly applied as tunnelled subcutaneous access devices. These mono- or dual-lumen catheters are also compatible with titanium port systems.

Infection and thrombosis are the leading causes of catheter loss with intraluminal infections being more problematic than exit site infections. Therefore minimizing infection incidents is the most important challenge for reducing individual consequences for the patients (risk of endocarditis) and health care expenses.

Catheter related infections may develop septic symptoms which require the immediate removal of the catheter. A systemic antibiotic treatment to salvage the catheter is mostly not successful due to the lack of considerable inhibiting concentrations of the antibiotic substance inside the catheter and the adherence properties of micro organisms. Catheter related bacteraemia is a common complication of all central venous catheters with an incidence of 3 – 9 episodes per 1000 catheter days.

The Antibiotic Lock Technique (ALT) reduces the infection rates in HD catheters and port systems dramatically. It was first described by B. Messing in 1988: The instillation of an antibiotic solution into the catheter during the interdialytic period can reduce the bacterial colonisation of the lumen and therefore prevent the development of a biofilm. Due to the leakage of the lock solution into the bloodstream, however, the prophylactic use of antibiotics is not recommended because of the resistance development of micro organisms and the corresponding side-effects (ototoxicity of gentamicin).

These aspects taken into account, the antimicrobial ingredient (cyclo)-tauroldine is an active ingredient for the prevention of catheter related blood stream infections. (Cyclo)-tauroldine acts via transferring methylol C-1 building blocks to the nucleophilic centres of microbial structure molecules. As a consequence cell walls of bacteria and fungi are destroyed. (Cyclo)-tauroldine is also active against highly resistant germs like MRSA, VRE and Mycobacterium chelonae.

(Cyclo)-tauroldine combined with citrate and heparin resp. urokinase provides the patency of the access device. The active antimicrobial ingredient is systemically non-toxic and is quickly degraded to the physiological amino acid taurine if inadvertently instilled into the blood stream.

The prophylactic use of TauroLock™ therefore solves the problem of catheter- and port-infections safely and effectively.

For these reasons TauroLock™ is recommended e.g. in the Hygiene Guidelines completing the German Dialysis Standard as well as in the evidence –based recommendations of the German Society for Paediatric Oncology and Hematology. (GPOH). It is also supported by the hygiene guidelines of the University of Bonn (Germany).
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Tauroludine–citrate lock solution (TauroLock™) significantly reduces CVAD-associated grampositive infections in pediatric cancer patients. A. Simon et al., BMC Infectious Diseases. 2008, 8:102.


C. Providing Patency with Urokinase


Preventing infections of central venous catheters with a tauroludine/citrate solution; O. Kramenko, Western Galilee Hospital, Nahariya, Israel, Presentation at EDTNA/ERCA Congress 2006, Madrid.

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D. Antibacterial Activity of TauroLock™/ Prevention of Biofilm
