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# A guide to: catheter lock solutions for the prevention of CRBSI

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The demand for central venous access devices (CVADs) is increasing. Even with the most stringent and fastidious aseptic technique, life-threatening complications such as catheter-related bloodstream infection (CRBSI) or central venous occlusion can occur. Good catheter care requires an experienced, multidisciplinary team using appropriate vascular devices who are trained to identify and aggressively treat CRBSIs, catheter occlusions and catheter-related thrombosis (Dibb et al, 2017).

Infections associated with vascular access devices account for up to 20% of hospital-acquired infections in the UK, and are associated with a longer hospital stay, and higher mortality and treatment costs (Health Protection Agency, 2012). They cost an estimated £15 000 per episode, excluding the expense of the additional length of stay for the patient (Lal et al, 2019).

Although the rate of CRBSI nationally is falling, constant surveillance is required to ensure rates stay low, and prevention is better than cure (Inagaki and El Feghaly, 2019). Many hospitals have achieved low rates or even eliminated CRBSI altogether, due to preventive measures such as the use of catheter-related care bundles (Hsin et al, 2017).

Some infections arise at catheter exit sites or result from

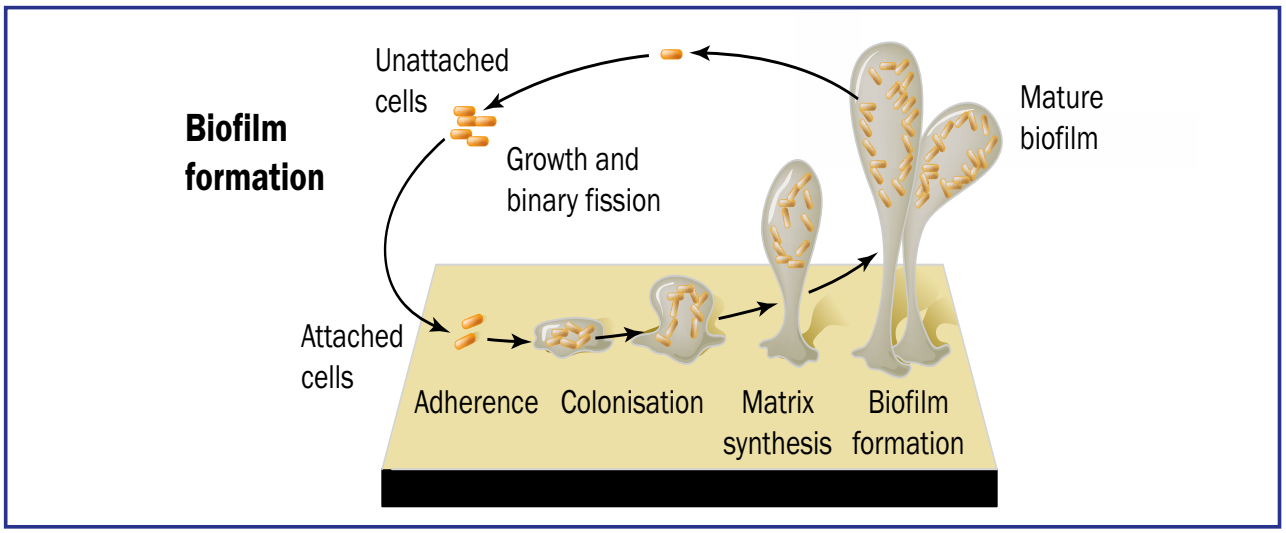



**Figure 1. Biofilm formation**

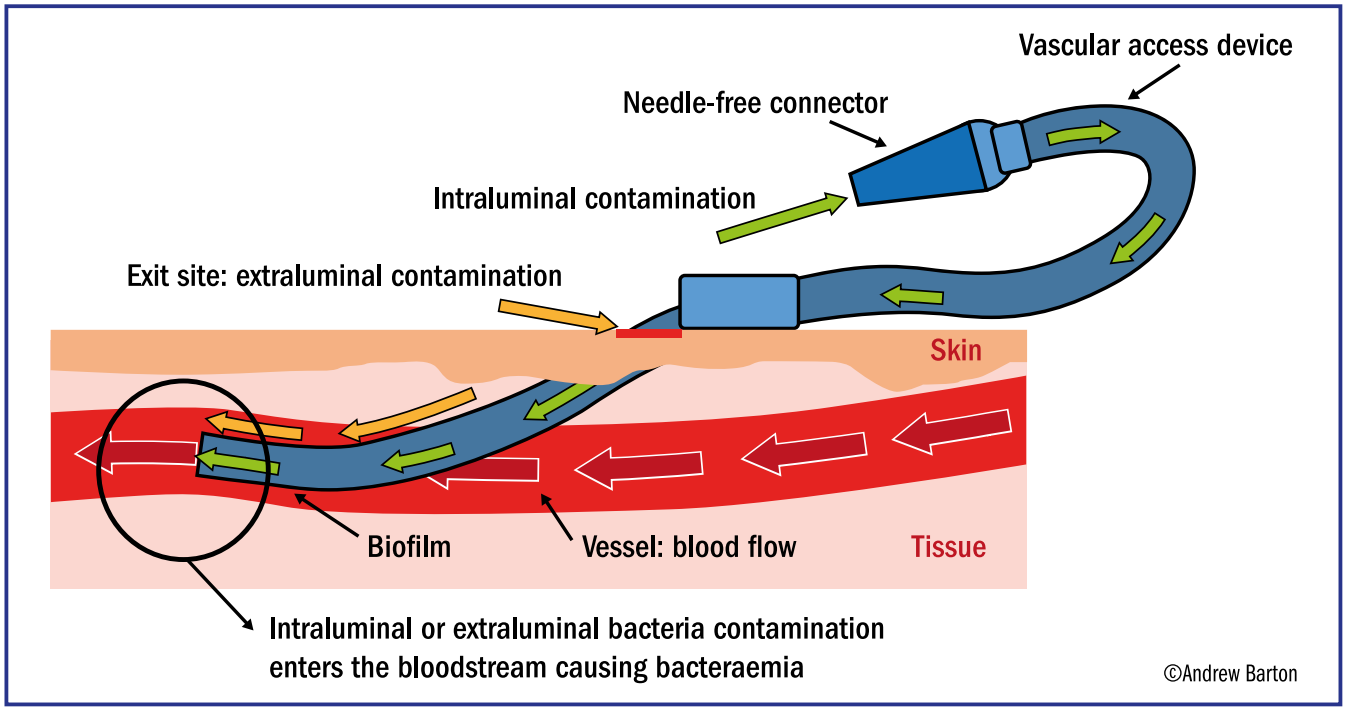



**Figure 2. How infection arises during infusion therapy**

haematogenous spread (Barton, 2019), but the more common CRBSIs start at the catheter hub (Lal et al, 2019).

Organisms from the catheter hub can migrate to the inner surface of the catheter and form an adherent biofilm (*Figure 1*) (Bond et al, 2020). During infusion therapy, these organisms enter the circulation via flow from the catheter; this can be facilitated by the presence of biofilm, which acts as a medium from where microorganisms can develop and spread (Gabriel, 2020) (*Figure 2*).

Prevention of CRBSIs and salvage of infected CVCs is vital to maintaining long-term venous access in patients (Bond et al, 2018). The fewer central venous access device (CVAD) insertions a patient undergoes in their lifetime, the better their vessel health will be.

Gabriel (2020) recently published an overview of CVAD catheter lock solutions in relation to how they reduce CRBSIs. This included the use of antimicrobial catheter lock solutions, which can reduce the risk of CRBSI and, in some cases, can be used to treat catheter colonisations as well.

Catheter locks are used when a solution is administered into a CVAD without flushing after administration. The solution is left inside the CVAD lumen until the next time the device is used at

**Table 1. Characteristics of TauroLock and TauroSept lock solutions**

| Lock solution | Advantages | Disadvantages |
|---|---|---|
| TauroSept (taurolidine 2% monotherapy) | ■ Single agent; highest concentration of taurolidine available in the UK for catheter lock solutions<br>■ Licensed for both prevention and treatment of catheter infections<br>■ Prevents both bacterial and fungal growth<br>■ Shown better anti-microbial activity (in vitro) than TauroLock (Olthof et al, 2014)<br>■ Reduction in catheter-related bloodstream infection (CRBSIs) as highlighted in European Society for Clinical Nutrition and Metabolism (ESPEN) guidelines (Pironi et al, 2020)<br>■ Anti-adherence with anticlotting properties disrupt adherence of bacteria to the surface of the central venous access device (CVAD), impeding biofilm development<br>■ Prevents biofilm development<br>■ Broad-spectrum activity, including against MRSA, vancomycin-intermediate *Staphylococcus aureus* and vancomycin-resistant *Enterococcus* spp<br>■ Is not an antibiotic so does not lead to antibiotic resistance (Bisseling et al, 2010) | Initial cost of TauroSept compared with other solutions for catheter care, eg saline flushes |
| TauroLock (taurolidine 1.34% + citrate 4%) | ■ Reduction in CRBSIs as highlighted in ESPEN guidelines (Pironi et al, 2020)<br>■ Anti-adherence with anticlotting properties disrupt adherence of bacteria to the surface of the CVAD, thereby impeding biofilm development<br>■ Also available with the addition of heparin (TauroLock-Hep 100 and TauroLock-Hep 500) for individuals not at risk of heparin-induced thrombocytopenia, as well as with urokinase (TauroLock-U25.000)<br>■ Is not an antibiotic so does not lead to antibiotic resistance (Bisseling et al, 2010) | Initial cost of TauroLock compared with other solutions for catheter care, eg saline flushes<br>Taste disturbances reported by patients, thought to be caused by citrate |

Source: adapted from Bisseling et al (2010), López-Briz et al (2018), Clark et al (2019), Gudiol et al (2018), Lopes et al (2019), Gabriel (2020), Olthof et al (2014)

which point the locking solution can be aspirated or, in some instances, flushed into the patient depending on the locking regimen.

For patients with long-term CVADs, locking the catheter with a solution that inhibits biofilm, bacterial colonisation and thrombus formation is essential. Gabriel (2020) outlines the role biofilm plays in the development of CRBSI and the importance of reducing the risk with the use of catheter lock solutions such as taurolidine.

Taurolidine is a non-toxic agent derived from the amino acid taurine

(Gabriel, 2020). It prevents the adherence of bacteria to catheter surfaces and has properties that prevent the formation of tumours and thrombus (Bisseling et al, 2010). While taurolidine is effective against Gram-positive and Gram-negative bacteria and fungi, it is an antimicrobial rather than an antibiotic so antibiotic resistance is not an issue (Olthof et al, 2013; Gudiol et al, 2018).

There is evidence that taurolidine's multiple properties have been shown to reduce CRBSI (Gudiol et al, 2018; Wouters et al, 2018; Clark et al, 2019; Gabriel, 2020). This makes catheter lock solutions containing taurolidine ideal for CVADs.

There are two recommended CVAD lock solutions which contain taurolidine: TauroSept (Geistlich) and TauroLock (TauroPharm).

TauroSept is licensed for instillation in CVADs between treatments in order to lock the catheter, to prevent bacterial and fungal growth leading to microbial infection in the CVAD lumen as well as to maintain device patency by avoiding clotting of blood. It is also licensed for the treatment of catheter-related infections (Health Research Authority, 2014; Pironi, 2020). TauroLock preparations contain taurolidine citrate; other preparations available from the same manufacturer also include heparin or urokinase. Heparin has, however, been shown to promote biofilm growth (Pironi et al, 2020) TauroLock is licensed for CRBSI prevention. The characteristics of TauroLock and TauroSept are given in *Table 1*.

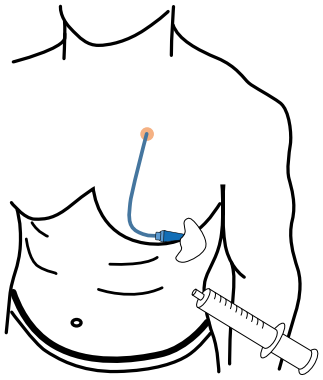
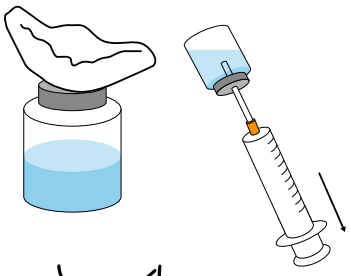
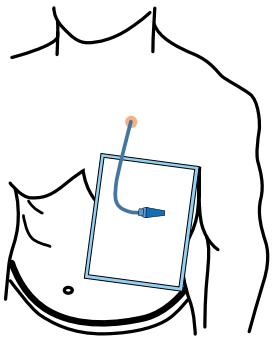
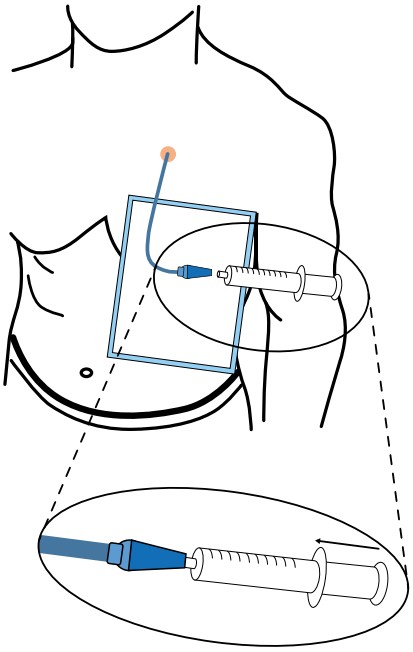
*Table 2* shows how to administer TauroSept. The principles are the same for any IV administration; a sterile aseptic technique should be used at all times. **BJN**


Barton A. The case for using a disinfecting cap for needlefree connectors. Br J Nurs. 2019;28(14):S22–S27

Bisseling TM, Willems MC, Versleijen MW, Hendriks JC, Vissers RK, Wanten GJ. Taurolidine lock is highly effective in preventing catheter-related bloodstream infections in patients on home parenteral nutrition: a heparin-controlled prospective trial. Clin Nutr. 2010;29(4):464–468.

Bond A, Teubner A, Taylor M et al. Assessing the impact of quality improvement measures on catheter related blood stream infections and catheter salvage: experience from a national intestinal failure unit. Clin Nutr. 2018;37(6

## Table 2. TauroSept administration

| | How to administer TauroSept, step by step |
|---|---|
|  | 1. Use the manufacturer's product information leaflet to ascertain the amount of solution required to lock the device |
| | 2. Check TauroSept is prescribed on the drug chart |
| | 3. Wash hands and don personal protective equipment |
|  | 4. Using a sterile non-touch technique in line with your organisation's local policy, clean the needle-free connector, allow it to dry then attempt aspiration of the lumen |
| | 5. After aspiration, flush the device with 10 ml of saline |
| | 6. Clean the top of the drug vial and allow to dry. Withdraw TauroSept from the container using a 10ml syringe and blunt fill needle |
|  | 7. Using a sterile aseptic technique, place a small sterile drape under the catheter lumen, and clean the end of the needle-free connector in line with local policy |
| | 8. Maintaining a sterile non-touch technique, dock the syringe into the needle-free connector |
| | 9. Instil TauroSept slowly (not more than 1 ml/second into the access device |
|  | 10. The quantity of solution should be sufficient to fill the lumen completely |
| | 11. TauroSept will remain inside the access device until the next treatment (up to a maximum of 30 days) |
| | 12. Before the next treatment, TauroSept must be aspirated and discarded in accordance with the institution's policy for infectious waste disposal |
| | 13. If TauroSept cannot be aspirated, slow flushing (not more than 1 ml per 3 seconds) is possible |

Refer to TauroSept Instructions for Use for further information and prior to product use

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# TauroSept®
# Tough enough.

## For prevention *and* treatment of catheter infections.[1]

**Taurolidine, 2% strength.[1]**

**Broad-spectrum antimicrobial that battles the intraluminal biofilm.[1,2]**

**Over 10 years of real-world experience[3] including clinical studies demonstrating effectiveness in the prevention of catheter-related bloodstream infections.[2,4,5]**

For more information about TauroSept, please contact your local Calea Business Development Manager on **01928 533500.**

**TauroSept is a class III medical device according to MDD 93/42 EEC.[1] TauroSept is intended for installation in intravascular catheters between treatments in order to prevent bacterial and fungal growth leading to microbial infection in the catheter lumen, as well as to maintain device patency and to avoid staphylococcal-induced clotting of blood. TauroSept can also be used as adjuvant treatment in infected catheters.[1]**

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TauroSept is manufactured by Geistlich Pharma AG and distributed in the UK by Calea and Fresenius Kabi.

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