Abstract:

Insertion of a central venous catheter is one of the most common invasive procedures applied in hemodialysis therapy for end-stage renal disease. The most important complication of a central venous catheter is catheter-related infections that increase hospitalization and duration of intensive care unit stay, cost of treatment, mortality, and morbidity rates. Pathogenic microorganisms, such as, bacteria and fungi, enter the body from the catheter insertion site and the surface of the catheter can become colonized. The exopolysaccharide-based biofilms from bacterial colonies on the surface are the main challenge in the treatment of infections. Catheter lock solutions and systemic antibiotic treatment, which are commonly used in the treatment of hemodialysis catheter-related infections, are insufficient to prevent and terminate the infections and eventually the catheter needs to be replaced. The inadequacy of these approaches in termination and prevention of infection revealed the necessity of coating of hemodialysis catheters with bactericidal and/or antiadhesive agents. Silver compounds and nanoparticles, anticoagulants (e.g., heparin), antibiotics (e.g., gentamicin and chlorhexidine) are some of the agents used for this purpose. The effectiveness of few commercial hemodialysis catheters that were coated with antibacterial agents has been tested in clinical trials against catheter-related infections of pathogenic bacteria, such as Staphylococcus aureus and Staphylococcus epidermidis with promising results. Novel biomedical materials and engineering techniques, such as, surface micro/nano patterning and the conjugation of antimicrobial peptides, enzymes, metallic cations, and hydrophilic polymers (e.g., poly) on the surface, has been suggested recently.

Reference: