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## An *in vitro* investigation of the antimicrobial activity of silver-processed catheters for external ventricular drainage

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### Background

Ventriculitis is a serious complication of external ventricular drainage (EVD). Silver-processed catheters (S-PC) are available that are intended to reduce the risk of infection. Clinical results of use of S-PC in other settings have been mixed, with benefit limited to only short-term use [1,2]. Little clinical experience of S-PC for EVD use [3], and no in-depth laboratory studies have been reported. We therefore examined the catheters to determine their antimicrobial activity in clinically relevant tests.

### Materials and methods

Test bacteria were *Staphylococcus epidermidis*, *Staphylococcus aureus* (MRSA) and *Escherichia coli*. Catheters (Silverline®) were purchased from Forth Medical Ltd, UK. For comparison, an in-house processed catheter [4] was tested. Both contain nanoparticulate silver. Two tests were conducted, and scanning electron microscopy (SEM) was also carried out. tK100: This measures the time taken to kill 100% of bacteria when attached to the catheter material [5]. *In vitro* challenge5 determines the ability of the S-PC to resist colonisation in flow conditions when repeatedly challenged with bacteria (as in EVD). In addition, focused ion beam SEM (FIBSEM) investigated the distribution of silver in the catheter materials.

### Results

At high bacterial inoculum (107 cfu/mL) both S-PCs failed to show any antimicrobial activity and they were

also not able to resist colonisation. At low inoculum (104 cfu/mL) initial reduction in viability in the tK100 test was followed by resurgence after 2 days to control levels. Again, the S-PC became colonised. FIBSEM showed more silver nanoparticles in the in-house catheter material but it still did not show superior activity.

### Conclusion

S-PC exhibit antimicrobial activity for a few days, after which they are ineffective in killing attached bacteria. This may be sufficient to reduce infection rates in very short-term EVD.

### References

1. Saint S, Elmore JG, Sullivan SD, Emerson SS, Thomas D, Koepsell TD: **The efficacy of silver alloy-coated urinary catheters in preventing urinary tract infection: a meta-analysis.** *Amer J Med* 1998, **105**:236-241.
2. Niël-Weise BS, Arend SM, Broek PJ van den: **Is there evidence for recommending silver-coated urinary catheters in guidelines?** *J Hosp Infect* 2002, **52**:81-87.
3. Beer R, Lackner P, Pfausler B, Schmutzhard E: **Nosocomial ventriculitis and meningitis in neurocritical care patients.** *Neurocrit Care* 2009, **10**:363-367.
4. Furno F, Kelly S, Morley S, Wong B, Sharp BL, Arnold PL, Howdle SM, Bayston R, Brown PD, Winship PD, Reid HJ: **Silver nanoparticles and polymeric medical devices: a new approach to prevention of infection?** *J Antimicrob Chemother* 2004, **54**:1019-1024.
5. Bayston R, Ashraf W, Bhundia C: **Mode of action of an antimicrobial biomaterial for use in hydrocephalus shunts.** *J Antimicrob Chemother* 2004, **53**:778-782.