The *in-vitro* antibacterial activity of Nanocrystalline Silver dressings against bacteria with NDM-1 carbapenemase

**Russell Hope**, **Shazad Mushtaq**, **Kiersten Vaughan**, **Emma Woodmansey**, **Chris Roberts**, **David Livermore**


**Purpose**

Carbapenems are among the most powerful antibiotics available, and often are used to treat infections due to otherwise multiresistant gram-negative bacteria. The emergence of carbapenem resistance is therefore deeply disturbing, since there are few antibiotics in reserve behind the carbapenems. Enzymes that cause resistance to these antibiotics, carbapenemases, have appeared in bacteria such as *Escherichia coli*, *Enterobacter* spp., *Klebsiella pneumoniae*, which account for the majority of opportunistic Gram-negative infections. These enzymes include the carbapenemases of New Delhi metallo-

**ß**-lactamase 1 (NDM-1), which is frequently isolated in India and Pakistan and which is being imported into Europe. Most bacteria with NDM-1 are broadly resistant to 

**ß**-lactam and non-

**ß**-lactam antibiotics, creating major treatment difficulties when patients have severe infections. The bacteria carrying these enzymes can cause opportunistic infections in hospital patients, with common infection sites including the blood, urinary tract, lungs and wounds.

Enterobacterial carbapenemases are plasmid mediated and can spread among bacterial strains and species. Little is known however regarding the resistance of bacteria with these enzymes to silver compounds. This study investigates the antibacterial efficacy of Nanocrystalline Silver dressings versus a collection of NDM-1 producers.

**Methods**

Five isolates with NDM-1 enzymes (*Acinetobacter baumannii*, *Citrobacter freundii*, *Enterobacter spp.*, *Escherichia coli* and *Klebsiella pneumoniae*) were tested in triplicate against three wound dressings containing Nanocrystalline Silver in comparison to a non-antimicrobial control.

**Dressing samples** (2cm x 2cm) were inoculated with 0.5ml volumes of 1x10⁶ cfu/ml inoculum and incubated at 37°C for 0, 0.5, 2 and 4 hours. At each sampling time, the silver activity of each dressing was assessed by using STS neutralizer solution (0.85% sodium chloride, 1% Tween® 20 and 0.4% sodium thymocollate). The surviving bacteria in complete samples at these intervals were enumerated by Miles and Misra counts, with log reductions in viable organisms calculated, compared with the 0 hour control samples.

**Results**

All three Nanocrystalline Silver dressings achieved log reductions of >4 log₁₀ cfu/sample within 30 minutes for all 5 strains.

There was no reduction in count by the non-antimicrobial control.

**Conclusions**

Resistance to **ß**-lactam and non-**ß**-lactam antibiotics creates major treatment difficulties when patients have severe infections. The fast interventional activity of Nanocrystalline Silver dressings against bacteria with NDM-1 enzymes, demonstrated in this study, show these products effective against these highly resistant bacteria.

**References**


©2012 Smith & Nephew, Inc., All rights reserved.

The author(s) of this abstract/poster may or may not be employed by Smith & Nephew. These materials are provided for educational use only and do not imply the authors have endorsed Smith & Nephew’s products or services. The techniques being used are included or reviewed by Smith & Nephew.

Poster presented at CMSIC 2012