

# Smart Solutions for HCAI



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## EVALUATION REPORT:

### Chemspec Europe Ltd Cold Fogging System using a Water-Based Antimicrobial (Formula 429)

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#### Introduction

Smart Solutions for Healthcare Associated Infections (HCAI) is a national programme that aims to bring forward new technologies with the potential to reduce HCAI rates within the NHS. The programme was run by *TrusTECH*<sup>®</sup>, The North West of England NHS Innovations Hub, on behalf of the Department of Health's HCAI Technology Innovation Programme, and supported by the NHS National Innovation Centre.

Following a national call for innovative products and technologies from a range of diverse industries, nine products were selected for further evaluation within an NHS setting. The aim of the evaluation was to assess the potential of the product to contribute to the reduction of HCAs in a scientifically robust manner.

One of the products selected for evaluation was an Ultra Low Volume Cold Fogging System; using Formula 429 antimicrobial product developed by Chemspec Europe Ltd. Formula 429 is a water-based broad spectrum anti-microbial that the manufacturer claims can be fogged to control levels of environmental bacteria. It does not require heating and does not use solvents or chlorine-based compounds. Chemspec Europe Ltd has a history of developing aerosol and fogging systems for cleaning, decontamination and odour control. For the purpose of this study Chemspec Europe Ltd commissioned a team of Integrated Service Solutions (ISS) technicians to deliver the decontamination fogging.

This evaluation was conducted within hospitals of Barts and The London NHS Trust, in ward areas including: infection control side rooms, patient toilet and bath areas, sluice rooms and bedded bays that had been designated for maintenance decontamination as part of a routine deep clean.

The principal investigators were Dr Arthur Tucker, Principal Clinical Scientist and Senior Lecturer, and Martina Cummins, Nurse Consultant Infection Control, at Barts and The London NHS Trust.

#### Objectives

- To evaluate the effectiveness of Chemspec Europe Ltd cold fogging system using Formula 429 in decontamination of Barts and The London NHS Trust hospitals' designated assessment areas for planned maintenance decontamination.
- To evaluate the effectiveness of the cold fogging system using Formula 429 in decontamination of equipment such as commodes and wheelchairs.

- To evaluate the product's performance in practice, i.e. 'turnaround times' for patient areas.

## Methodology

The areas of the hospitals to be cold fogged were selected by liaison between the principal investigators, ISS providers and nursing staff responsible for the wards. Fogging was carried out following Trust and ISS standard operating procedures.

All information from each fogging procedure was recorded by the ISS technicians; this was sent to the principal investigator once completed. The information recorded included the location of the room/area, an estimate of the volume of the room/area in cubic metres, time of arrival of ISS technicians, time taken to obtain the pre-fogging microbial samples, time that the fogging commenced and ended, time the room was ready for clinical usage after checking for absence of residual Formula 429 (negative chemical reaction on Quat™ test strips), and finally the time taken for post-fogging microbial sampling. Temperature and humidity data were also collected.

There were 6 sampling sites in each of the rooms fogged, 4 that were the same for each fogging episode, and 2 that varied between fogging episodes.

Prior to fogging each sampling site was marked by either indelible pen or masking tape as appropriate. Pre-fogging samples were taken from the left of the mark and post-fogging samples to the right.

Contact agar plates containing 3 different types of media were used to collect and culture the samples. Each plate was pressed gently onto the sampling site, held for 2 seconds and then removed. This was repeated for each plate. For each area being fogged at least 6 samples were taken pre- and post-fogging. Each plate was given a unique number to identify the location and whether the sample was taken pre- or post-fogging. To reduce possible bias, the identity of the plates was withheld from the plate readers.

All culturing and plate reading were performed in the Department of Microbiology at the London Hospital. Results were recorded for Total Viable Count, *E.coli*, *C. difficile* and MRSA.

## Number Evaluated

A total of 120 rooms were cold fogged with Formula 429 during this 12-week study: 13 (11%) infection control side rooms, 55 (46%) patient toilets and bathrooms, 17 (14%) sluice rooms, and 35 (29%) other rooms, e.g. 4-bed bays.

Six samples were collected from each room pre- and post-fogging, equating to a total of 720 bacterial samples analysed before and after fogging.

Although not written into the original study protocol, a total of 168 swabs for ATP tests were taken pre-fogging and 162 swabs were taken post-fogging.

## Results

Evaluation of Chemspec Europe Ltd Cold Fogging System using Formula 429, within hospital wards of Barts and The London NHS Trust, showed that the procedure was effective in reducing environmental total viable counts that included *E. coli*.

British Standard EN 1276 'Chemical disinfectants and antiseptics — Quantitative suspension test for the evaluation of bactericidal activity of chemical disinfectants and antiseptics used in food, industrial, domestic, and institutional areas' states that in laboratory conditions the product (disinfectant/antiseptic), under the required test conditions (20°C, 5 min, four selected referenced strains), shall demonstrate at least a 5 log<sub>10</sub> reduction in viable counts

for the four reference strains: *Escherichia coli* NCTC 10418, *Pseudomonas aeruginosa* NCTC 13359, *Staphylococcus aureus* NCTC 10788, *Enterococcus hirae* NCTC 13383

Formula 429 when tested in accordance with BS EN 1276, tested at 1500 ppm total actives demonstrated antimicrobial efficacy at 20°C. A > 6 log<sub>10</sub> reduction was achieved for all bacteria in 30 seconds. BS EN 1276 requires a > 5 log<sub>10</sub> reduction in 5 minutes; therefore Formula 429 satisfies the requirements of the test. (A contact time of 5 minutes is stated in the EN 1276, however for this formula 429 laboratory test, an additional time point of 30 seconds was employed to assess rapid kill of the product).

When formula 429 was fogged in a live hospital environment, the results showed that of the samples taken for microbial culture from the 120 rooms fogged the total viable count of environmental bacteria was reduced approximately 8-fold to 12% (P<0.001) of that recorded pre-fogging (i.e. an 88% reduction). Regarding the organisms characterised, the likelihood of an occurrence of *E. coli* was also reduced 8-fold to 12% of pre-fogging values. However, no inferences about the effect of cold fogging on environmental *C. difficile* and MRSA could be made. Three non-significant counts of *C. difficile* were detected in samples taken pre-fogging, with none detected in any of the post-fogging samples. MRSA was not detected in any sample.

Although specified in the study objectives, a separate evaluation of equipment such as commodes and wheelchairs was not done. However, these types of equipment were included in the microbial sampling schedule (e.g. in sluice rooms and toilets/bathrooms). Therefore, it is anticipated that the reduction in overall bio-load shown by this study could be applied to these types of equipment individually.

Although it was planned that fogging would immediately follow cleaning, this was not always the case in practice since it was not always possible to match the schedule of the fogging operatives with that of the hospital wards. Despite not having the assurance that all fogging episodes had been preceded by cleaning, the Neogen AccuPoint 2 ATP System swab tests demonstrated a 75% reduction in ATP on the surfaces swabbed.

The mean cycle time and total turnaround time averaged approximately 1 hour for the type of room evaluated in the study. One hour was considered an acceptable period of time for the anticipated benefits of this method of decontamination. The high level of liaison and cooperation between the teams of ISS technicians and hospital staff also ensured that the cold fogging proceeded without disrupting the day-to-day running of the wards.

## Conclusions

- Based on environmental bacterial sampling before and after cold fogging of hospital ward rooms such as infection control side rooms, patient toilets and bath areas, sluice rooms, and bedded bays, with a novel antimicrobial (Chemspec's Formula 429), an 88% reduction in the total viable counts of environmental bacteria can be anticipated.
- The process of deploying this technology into an acute hospital setting proved entirely straightforward. The fogging technicians (ISS) and hospital staff worked well in planning out daily schedules and the fogging team took a very responsive and proactive approach in addressing each area. The cooperation between ISS technicians and nursing staff also meant the cold fogging proceeded effectively without disrupting ward functioning.
- Whilst there was a drive to ensure minimal disruption to the wards/areas being fogged, future studies could concentrate on optimising the time taken to achieve the necessary bacterial kill by varying the duration of fogging and applied dose of the antimicrobial agent. Ayliffe (BMJ 1966) cites the use of a variety of disinfectants. The study examines their use on hospital floors and looks at the variation in mean bacterial count before and after cleaning. In the study 'soap and water caused a mean reduction of 80% and

disinfectants caused a mean reduction of 93-99%. It would be expected that any disinfecting solution used within the healthcare environment would match or exceed the mean reductions found by Ayliffe. Future work could be undertaken investigating how Formula 429 performs against currently used disinfectants within the NHS such as Hypochlorite, Hydrogen peroxide and Chlorine dioxide. Future work could also address the real time needs of the Trust in question, i.e. fogging isolation rooms where there is known contamination with pathogenic organisms such as *C. difficile*.

- Turnaround time, i.e. time from start of fogging to return to clinical usage, averaged no more than 1 hour for the rooms tested in this study.
- Overall the study indicates that cold fogging with such a broad spectrum water-based antimicrobial is a practical and effective method of decontaminating hospital ward areas that are potential sources of infection.

Ayliffe, G.A.J.; Collins, B.J. and Lowbury, E.J.L.; 'Cleaning and Disinfection of Hospital Floors'. British Medical Journal, 1966, 2, 442-445

### **Further information**

Smart Solutions for HCAI is run by *TrusTECH*, the North West Innovations Hub.

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