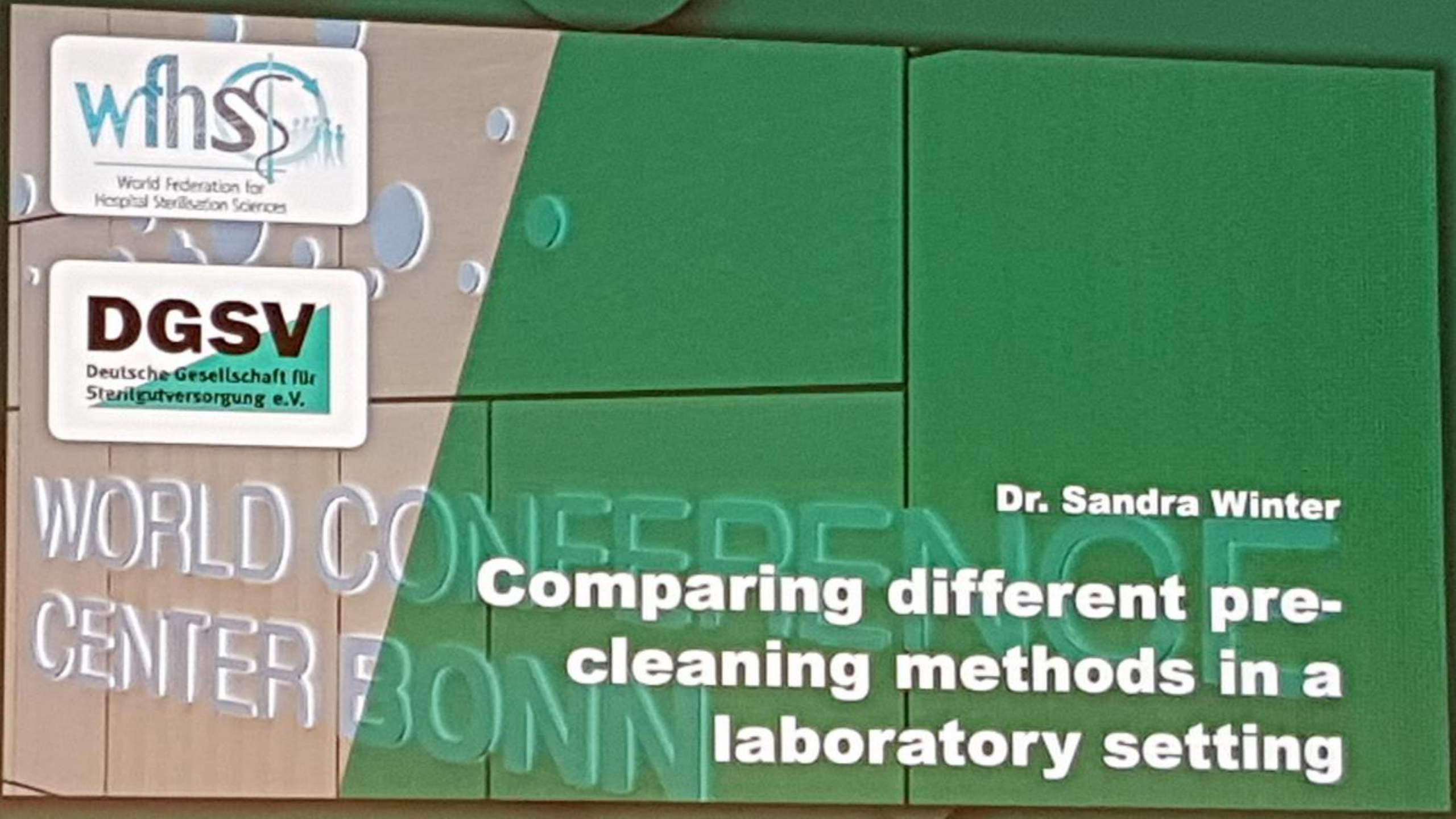


Dr. Sandra Winter

# Comparing different pre-cleaning methods in a laboratory setting

# BACKGROUND

# Background I

- The UK was exposed to BSE between the early 1980's – mid 1990's
- Prions are difficult to inactivate and infectivity can survive steam sterilization at 134°C

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- Risk assessments have emphasized the importance of cleaning surgical instruments prior to sterilization
- High carriage rates emphasize the continued role of risk reduction strategies (DOH, 2005)

# Background II

- Previous workers have demonstrated the importance of maintaining surgical instruments in a moist state prior to loading into a wash process (Lipscomb et al., 2007)
- After surgery, proteinaceous residues, such as blood, can be adsorbed to the stainless steel surfaces of surgical instruments due to metal ion binding (Clarke et al., 2007)
- The drying of proteins causes a change in the molecular surface structure and increases the adherence to the stainless steel surface (Secker et al., 2011)

# Neurosurgery…

# Background III

- Concerns have been raised about the possible delays in cleaning instruments as they move from theatres to Centralized Decontamination Units (CDU) (Lipscomb et al., 2006)
- Residues of wetting agents/pre-cleaning treatment sprays were reported to cause discolorations of instruments or excessive foaming in automated washer disinfectors (AWD's)
- Enzymatic wetting agents have been found to corrode stainless steel instruments at extended contact times (Biering et al., 2010)
- No current standard to guide selection of appropriate wetting agents on the market by using a standardized method

# Choosing a pre-cleaning agent...

Gel ?

Alkaline ?


Enzymatic ?

Anti-corrosive ?

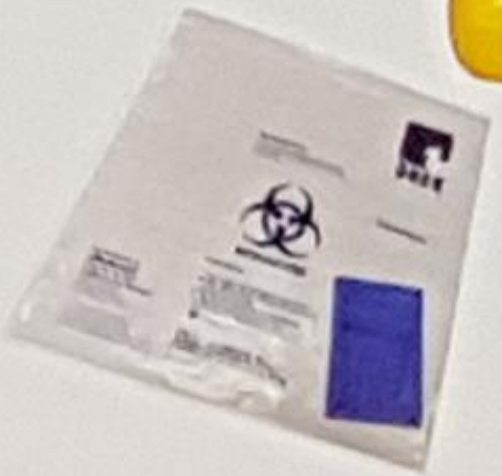
Biocidal ?

Foam ?

# Choosing a transport bag…

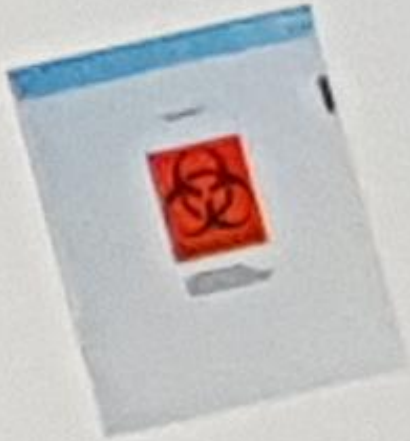
Sealable ?

Add water ?



Not sealable ?

Add pre-cleaning agent ?



# Aim

- The overall aim of this study was to investigate processes to improve the cleaning of neurosurgical instruments

  - The aim of this study was to determine which pre-cleaning method (pre-cleaning treatments/bags), in a laboratory setting, are the most efficacious

# The collaboration...

Scottish Infection Research Network

University of Glasgow

Health Facilities Scotland

NHS Greater Glasgow and Clyde

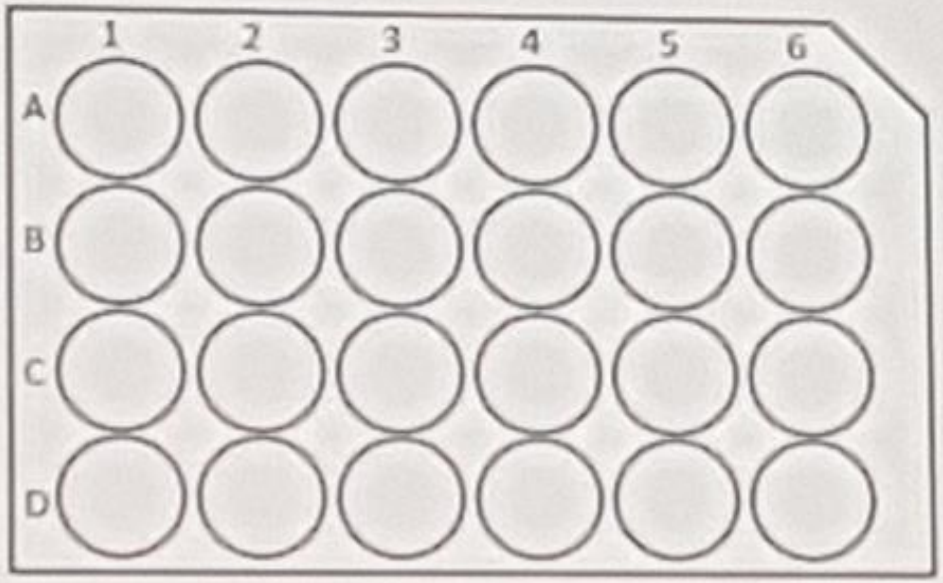
- Queen Elizabeth University Hospital – Neurosurgical Institute
- Central Decontamination Unit – Cowlairs

# Material and Methods I

- Assessment of humidity conditions within different sealable bag types
  - Bag1
  - Bag2
  
  } commercially available zip lock bags, intended to maintain moisture inside
  - Bag3 – ordinary supermarket sourced zip lock bag
- 60 ml of sterile water added the bags, containing a standard size surgical instrument tray
- Humidity measurements using data loggers (Ellab, Denmark), recording relative humidity (RH) at room temperature over the course of 6 hours
- Best performing bag was used for study phase 2

# Material and Methods II

- 24 stainless steel discs (D = 1 cm, surface area = 0.79 $cm^2$, mirror finish) in a 24 well plate (Costar)



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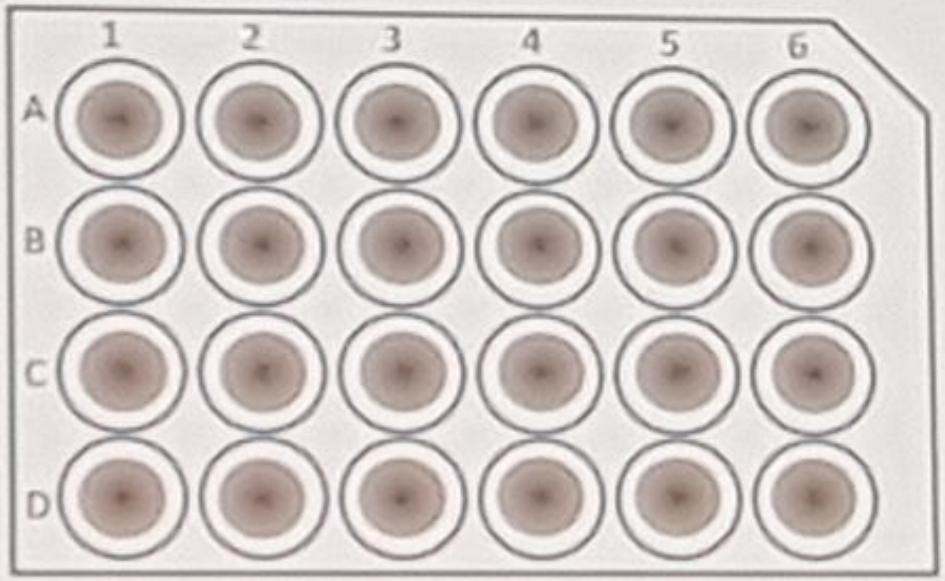

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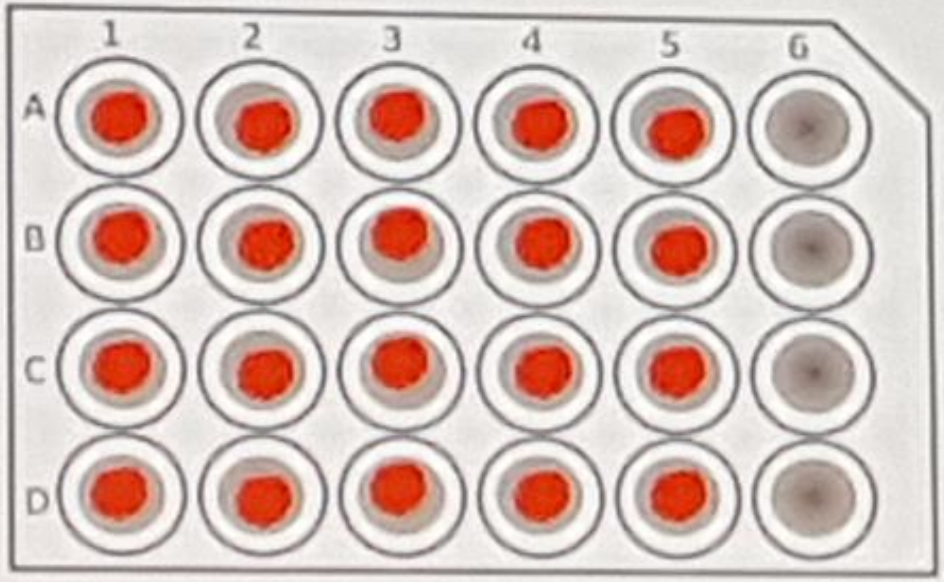
- 24 stainless steel discs (D = 1 cm, surface area = 0.79 $cm^2$, mirror finish) in a 24 well plate (Costar)
- 10µL of Edinburgh Test Soil (ISO/TS 15883-5) were pipetted onto 20 discs



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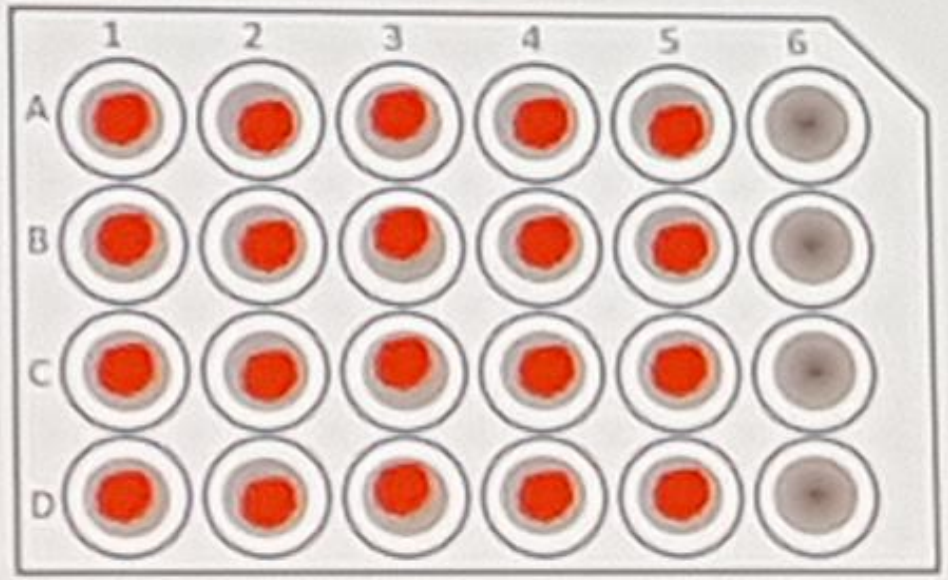
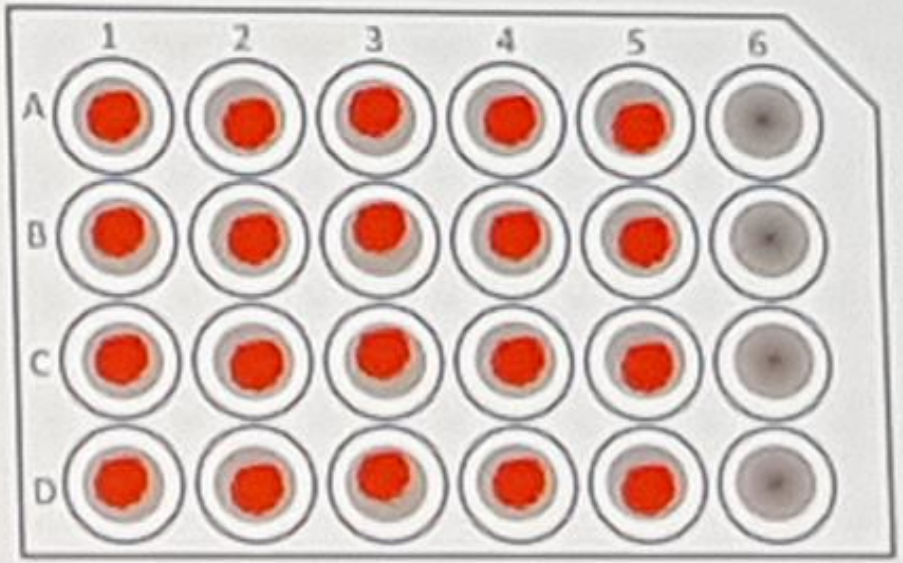
- 24 stainless steel discs (D = 1 cm, surface area = 0.79 $cm^2$, mirror finish) in a 24 well plate (Costar)
- 10µL of Edinburgh Test Soil (ISO/TS 15883-5) were pipetted onto 20 discs
- Air dry for 30 minutes (ISO/TS 15883-5)
- Plate was then transferred into bag and the pre-cleaning agent was applied according to manufacturer's instructions
- Left over night (ON) at room temperature (simulating waiting time at CDU)



# Material and Methods III

- Standardized washing step on a motorized rocking platform (set at 20 tilts per minute)
- Each well containing a soiled disc was exposed to 2 ml of 1% Sodium Dodecyl Sulfate (SDS) solution
- At 5 min, 10 min, 20 min, 40 min and 80 min, 3 discs were removed



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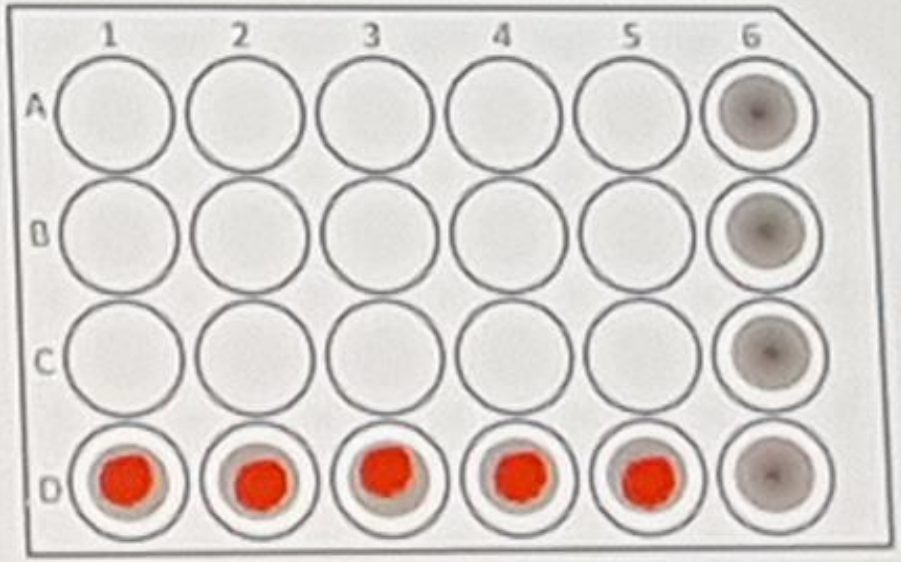
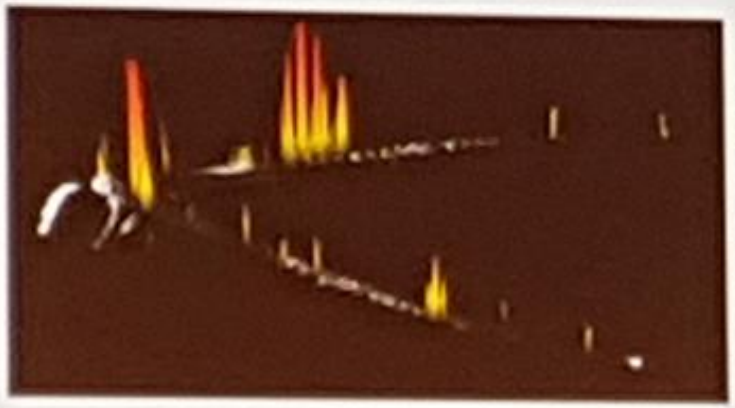
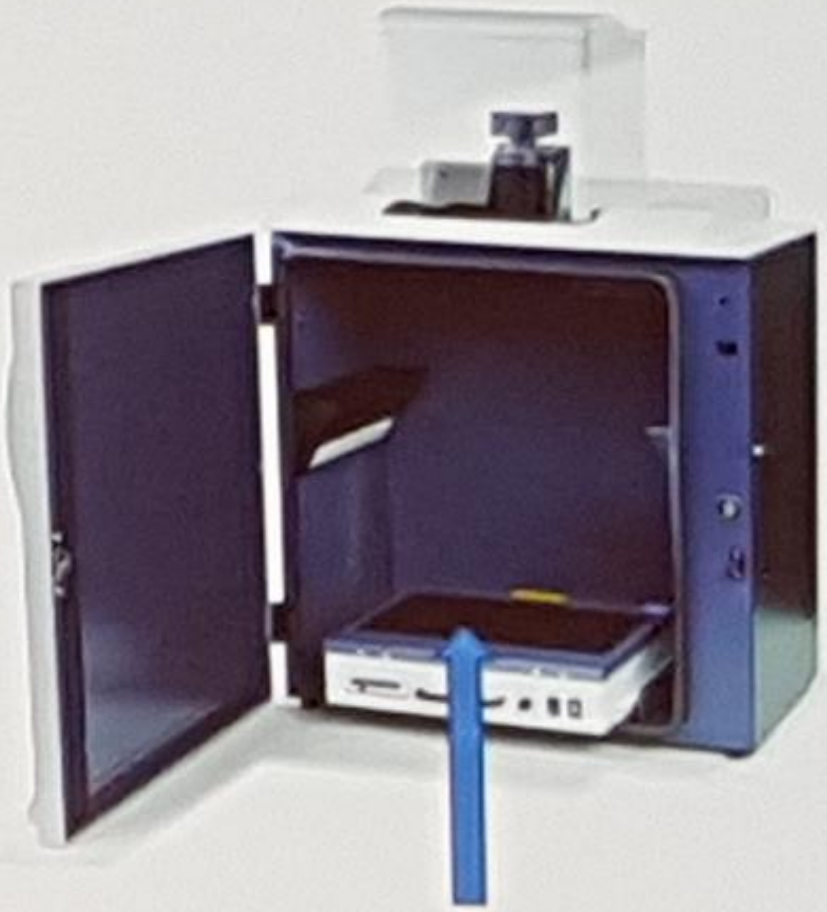


# What's a G-Box?

- Visualization of protein contamination
- Qualitative and quantitative
- Visible light for imaging specimen
- Spray reagent
- UV visualization of fluorescing protein
- Overlay of images
- Calculation of protein amount/instrument side
- Limit of detection was 50ng protein/$cm^2$





stainless steel item

# Material and Methods IV

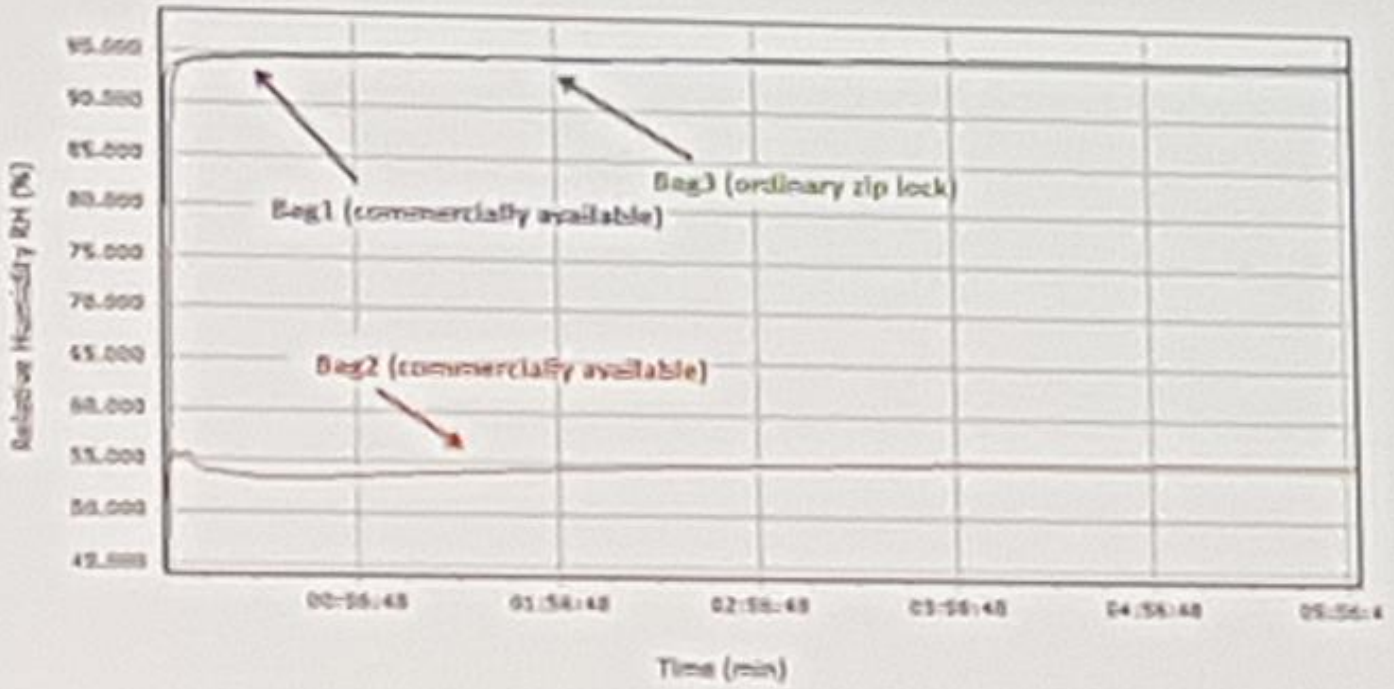
- Controls
  - soiled discs/no agent/no bag (positive control)
  - soiled discs/no agent/+bag (bag control)
  - clean discs (negative control)

- Pre-cleaning agents tested
  - Agent A – Gel formulation, multi-enzyme, neutral pH
  - Agent B – Foam formulation, enzymatic, neutral pH, biocidal
  - Agent C – Foam formulation, multi-enzyme, neutral pH
  - Agent D – Gel formulation, surfactants, neutral pH, corrosion inhibitors
  - Agent E – sterile water on a gauze wound pad

# RESULTS

# Results I

- The Bag3 (ordinary zip lock bag) and Bag1 maintained humidity levels of 95% RH over the course of six hours
- Bag2 humidity levels dropped to 55% RH over six hours

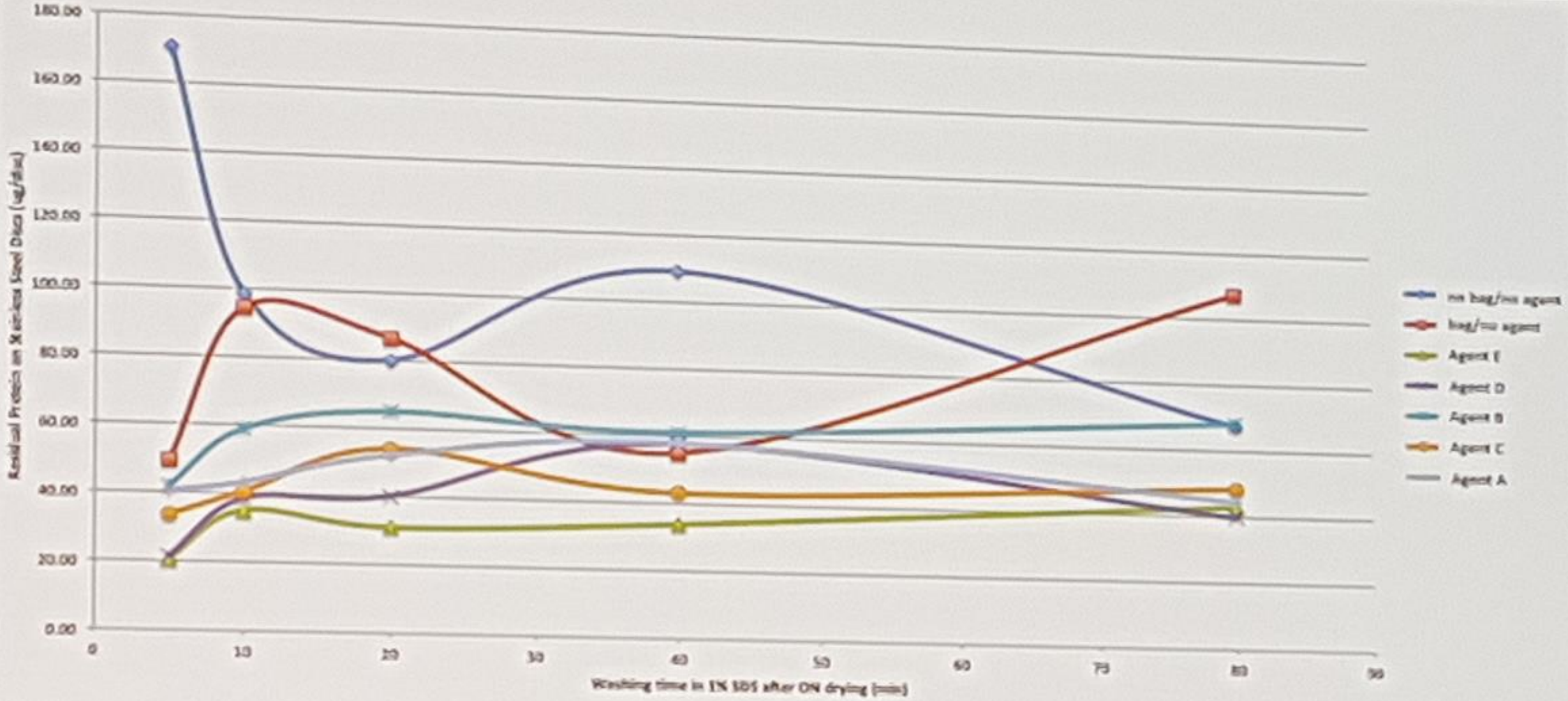


# Results II

- Mean protein level on stainless steel discs before treatment was 74.3 µg/ cm2 (range 33.0 – 154.3)

- Residual protein level results on discs demonstrated that Agent D and Agent E (sterile water on pad show significantly lower residual protein levels over time compared to all other sprays/foams and controls (p = 0.021 and 0.001)

| After 5 min washing | No bag/no agent | Bag/no agent | Bag/Agent E | Bag/Agent D | Bag/Agent C | Bag/Agent B | Bag/Agent A |
|---|---|---|---|---|---|---|---|
| Mean (µg protein /disc) | 171 | 49 | 21 | 21 | 33 | 48 | 40 |
| Median (µg protein /disc) | 122 | 52 | 15* | 7* | 31 | 14 | 39 |
| Standard Daviation | 114 | 27 | 11 | 24 | 11 | 61 | 22 |
| Range (µg protein/disc) | 51-379 | 15-89 | 11-43 | 3-68 | 11 - 49 | 4-172 | 14-76 |


180.00
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
0
10
20
30
40
50
60
70
80
90
Agent E
Agent D
Agent B
Agent C
Agent A

# Conclusions

- In terms of maintaining humidity levels over an extended period of time, an ordinary zip lock bag performs just a well as a commercially available one

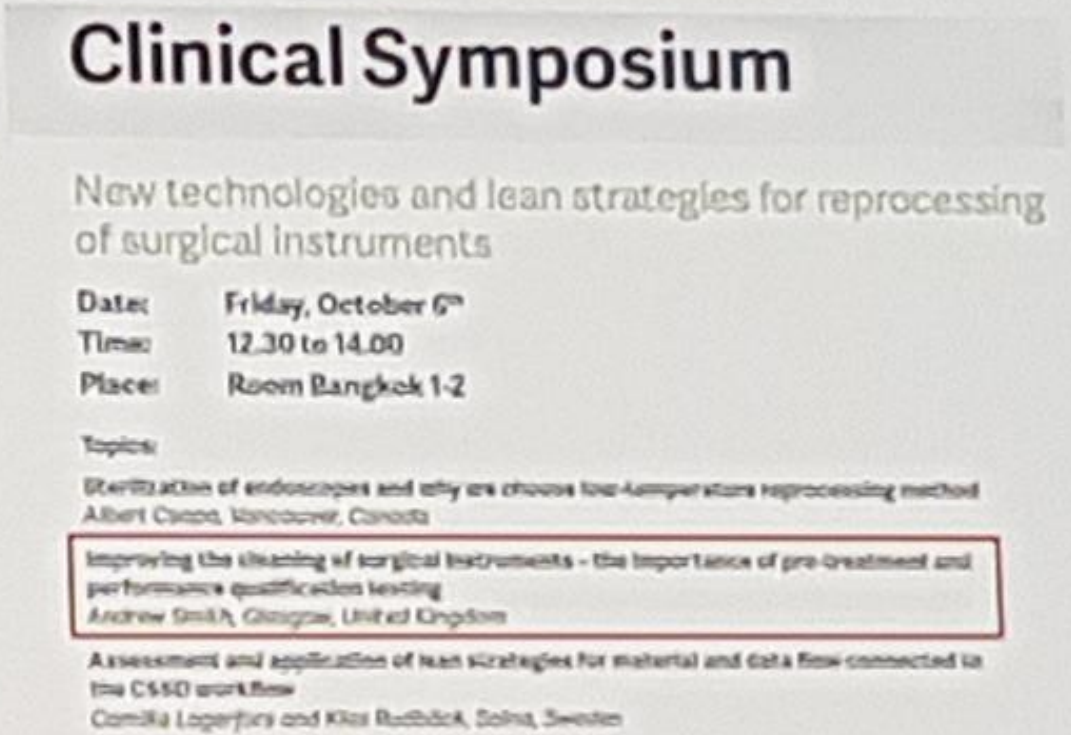
- In terms of improving cleaning of neurosurgical instruments, Agent D (gel formulation, surfactants, neutral pH, corrosion inhibitors) and Agent E (sterile water on a gauze wound pad) showed the most promising results in enhancing protein removal
  - Concerns about corrosion may be raised, when using sterile water on a wound pad over prolonged periods of time

- A wound pad soaked in sterile water in combination with an ordinary zip lock bag is equivalent to the best performing commercially available bags and/or pre-cleaning agents. The sterile water plus wound pad and ordinary zip lock bag proved equivalent to a commercially available pre-cleaning agent

- The method described in this study may be suitably adapted for use as a standard model for comparison of pre-cleaning treatments, aimed at improving the cleaning process for surgical instruments

# One more thing...

- Agents E and D were the best performing pre-cleaning treatments in a laboratory setting
- Further investigations – clinical trial on neurosurgical instrument sets



## Clinical Symposium

New technologies and lean strategies for reprocessing of surgical instruments

Date: Friday, October 6th
Time: 12.30 to 14.00
Place: Room Bangkok 1-2

Topics:

Sterilization of endoscopes and why we choose low-temperature reprocessing method
Albert Cappa, Vancouver, Canada

Improving the cleaning of surgical instruments - the importance of pre-treatment and performance qualification testing
Andrew Smith, Glasgow, United Kingdom

Assessment and application of lean strategies for material and data flow connected to the CSSD workflow
Camilla Lagerfors and Klas Rudbäck, Solna, Sweden

**Decon Research Group**
Andrew Smith
David Lappin
George Mcdonagh

**Cowlairs CDU**
Ian McIvor
Alan Stewart
Andrew Hamilton
David Shaw
Brian, Steven, Richard

**Health Facilities Scotland**
Sulisiti Holmes
David Hill

**Neurosurgical Insitute**
Pamela Philp
Nigel Suttner

# ACKNOWLEDGEMENTS

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# THANK YOU FOR YOUR ATTENTION