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Standard cleaning vs a disinfection cap for the decontamination of needle-free connectors.

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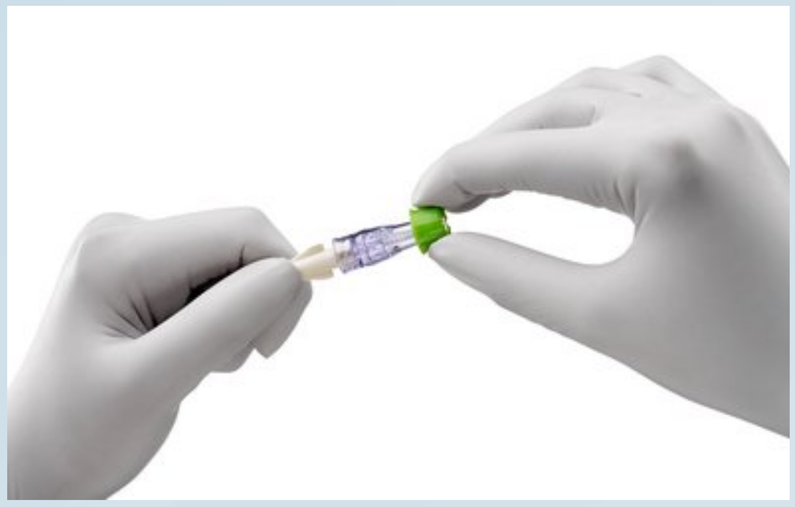
Introduction

- A major factor attributed to the level of infection risk associated with needle-free connectors is the efficacy of disinfection of the injection ports [1].
- Disinfection of connectors may not intuitive which may lead to non-compliance [1].
- Caps which attach to injection ports of connectors incorporating disinfectants have been developed.
- These caps act as passive disinfection devices ensuring connectors are always clean.
- Clinical studies evaluating these devices demonstrated reductions in hub colonisation [2], and central-line associated bloodstream infections (CLABSI) [3-7].
- The aim of the study was to determine under controlled laboratory conditions whether a continuous passive disinfection cap containing 70% (v/v) IPA was as effective as defined cleaning with a 2% (w/v) CHG in 70% (v/v) IPA wipe.

Methods

- Connectors used: MicroClave™ neutral displacement connector (ICU Medical) and Care-Site™ positive-displacement connector (BBraun).
- Cleaning devices used: Curos® caps containing 70% (v/v) IPA (3M Healthcare, figure) and 2% (w/v) CHG in 70% (v/v) IPA wipes (Sani-cloth CHG 2%, PDI).
- The injection port was inoculated with 5×10^6 CFU *Staphylococcus aureus* NCTC 6538 and allowed to dry.
- Disinfection caps were attached and compared with those cleaned with a wipe.
- All connectors were left at 20°C in air for 1, 3 or 7 days.
- Following contamination with *S. aureus*, a proportion of each type of connector were cleaned as above for 15 s with a wipe and allowed to dry for 30 s. These were then left for 7 days at 20°C and cleaned again with a wipe.
- Connectors were immersed into bijous containing 1 mL of neutralizing solution
- The bijous were sonicated for 10 min at 50 Hz and the solution inoculated onto chromogenic *S. aureus* plates (ChromID *S. aureus* [Biomerieux]).
- Median $\log_{10}$ colony-forming unit (CFU) reductions and 95% confidence interval (CI) were calculated and data analyzed using the Mann-Whitney test. The level of significance was < 0.05.

Curos® cap containing 70% (v/v) IPA



Results

- The minimum CFU count on the control connectors (those which were not decontaminated after inoculation with *S. aureus*) was 5.17 $\log_{10}$ CFU for MicroClave™ and 5.49 $\log_{10}$ CFU for CareSite™.
- Total kill (TK) therefore always represented a ≥ 5.17 or ≥ 5.49 $\log_{10}$ CFU reduction, respectively.
- Log_{10} CFU reductions in *S. aureus* following decontamination for 15 s with a wipe and incubation at room temperature for 1, 3 or 7 days or application of the disinfection cap for 1, 3 or 7 days is shown in the table.
- The disinfection cap resulted in a significantly higher reductions in *S. aureus* than the wipe.
- There was no difference in the $\log_{10}$ CFU reduction of *S. aureus* between the two different types of connector.
- Decontamination of the MicroClave™ with a wipe following inoculation with *S. aureus* and following each subsequent incubation period resulted in a higher $\log_{10}$ CFU reduction as compared to cleaning only following contamination ($p = 0.009$).
- The disinfection cap resulted in a significantly higher $\log_{10}$ CFU reduction compared to the two decontaminations with wipes for both MicroClave™ ($p = 0.041$), and CareSite™ ($p < 0.0001$).

Discussion & Conclusion

- Under controlled laboratory conditions a disinfection cap containing 70% (v/v) IPA was more effective at reducing microbial contamination of injection ports of needle-free connectors when compared to cleaning with 2% (w/v) CHG in 70% (v/v) IPA wipes.
- This may reflect the continuous antimicrobial activity of the decontamination offered by the caps.
- It could be argued that given the significant $\log_{10}$ CFU reductions observed with the wipe in this study, there is no requirement for the disinfection cap. However, if wipe compliance is low, the disinfection caps could prove a useful tool.
- The results of this study support the SHEA/IDSA practice special approach recommendation for preventing CLABSI to 'use an antiseptic-containing hub/connector cap/port protector to cover connectors' [8].

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Median (95%CI) $\log_{10}$ *Staphylococcus aureus* CFU reductions on two types of needle-free connectors after 1, 3 and 7 days following two decontamination methods. Total kill (TK) = no growth of *S. aureus* following decontamination.

Day	Decontamination method	Connector studied: MicroClave®	Comparison of wipe vs disinfection cap (P value)	Connector studied: CareSite®	Comparison of wipe vs disinfection cap (P value)	Comparison of MicroClave® vs CareSite® (P value)
1.	2% (w/v) CHG in 70% (v/v) IPA wipe	>6.45* (4.97-TK)	<0.0001*	TK (4.29-TK)	<0.0001*	0.49
	Disinfection cap	TK (TK-TK)		TK (TK-TK)		0.75
3.	2% (w/v) CHG in 70% (v/v) IPA wipe	4.66 (4.34-4.95)	<0.0001*	4.77 (4.39- 5.68)	<0.0001*	0.98
	Disinfection cap	TK (TK-TK)		TK (TK-TK)		0.057
7.	2% (w/v) CHG in 70% (v/v) IPA wipe	TK (TK-TK)	<0.0001*	TK (5.20-TK)	<0.0001*	0.15
	Disinfection cap	TK (TK-TK)		TK (TK-TK)		1.00

*=the median was half-way between the values of 6.45 and TK. +The reductions were greater for the disinfection cap.