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Effectiveness of Cleaning Protocols for a Therapeutic Animal Robot Used in the Intensive Care Unit

Breanna D. Hetland PhD, RN, CCRN-K

Jennifer Heusinkvelt BSN, RN

Mark Rupp MD

Paul D. Fey PhD, D(ABMM)

Caitlin Murphy PhD, D(ABBM)

See next page for additional authors

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Authors

Breanna D. Hetland PhD, RN, CCRN-K; Jennifer Heusinkvelt BSN, RN; Mark Rupp MD; Paul D. Fey PhD, D(ABMM); Caitlin Murphy PhD, D(ABBM); Gayle Gillett BSN, RN; Teresa Micheels MSN, RN; Melissa Baker BSN; Christina Bach BSN, RN; and Abigail Wawers BSN, RN

Breanna Hetland, PhD, RN, CCRN-K, Jennifer Heusinkvelt, BSN, RN, Mark Rupp, MD, Paul Fey, PhD, D(ABMM), Caitlin Murphy, PhD, D(ABBM), Gayle Gillett, BSN, RN, Teresa Micheels, MSN, RN, Melissa Baker, BSN, Christina Bach BSN, RN, & Abigail Wawers BSN, RN

Introduction

A new frontier in animal robotics opens a vast array of opportunities to utilize animal assisted interactions (AAI) to promote the physical and psychological well-being of critically ill patients. Robot animals may provide equivalent therapeutic benefits as live animals while mitigating the infection control risk that live animals pose to this patient population.

Purpose

Prior to implementing a study in the intensive care unit (ICU) to examine the therapeutic effects of an animal robot (Paro™) with critically ill ICU patients, we conducted a bioburden challenge to evaluate the effectiveness of our established cleaning protocols.

Cleaning Protocols

- Our **Daily Cleaning** Protocol utilizes a hospital-grade cordless handheld UV sanitizing wand over the entire surface of the robot.
- Our **Deep Cleaning** Protocol consists of an all-purpose cleaning spray, quaternary ammonium/isopropyl alcohol wipes, and bleach.

Cleaning and Testing Equipment

MRSA-UV handheld surface sanitizer



Hygiena SystemSURE Plus ATP Cleaning Verification System



Methods

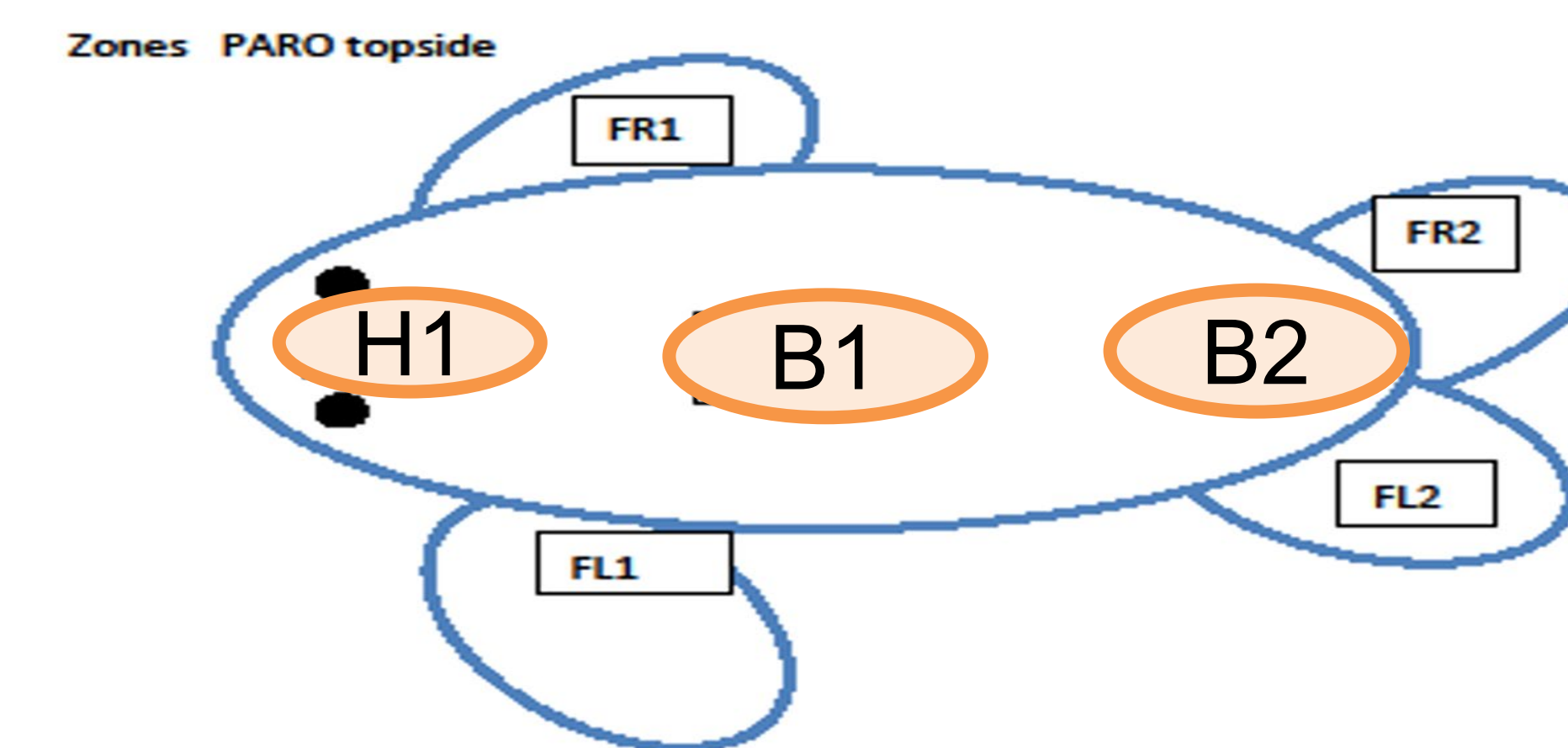
1. The robot was inoculated with *S. epi*, *E. coli*, *B. cereus*. These infections agents were applied to 3 separate locations on the robot.
2. The robot was then cleaned by study staff using the established protocols.
3. ATP was measured via the Hygiena SystemSURE Plus ATP Cleaning Verification System.
4. ATP measurements were obtained at baseline, immediately after inoculation, and immediately after the completion of the cleaning protocol(s).
5. Cultures were taken immediately after inoculation and completion of the cleaning protocol(s).

New cleaning protocols reduce the risk for infection and allow for the safe use of robotic animals during rehabilitation sessions in the pediatric ICU



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Swab Zones



Results

Daily Cleaning Protocol					
Location (Inoculant)	ATP Baseline	ATP after inoculation	Culture after inoculation	ATP after UV only	Culture after UV only
H1 (<i>S. epi</i>)	114	1261	7.5 x 10 ⁶	455	0
B1 (<i>E. coli</i>)	182	608	9.3 x 10 ⁵	259	0
B2 (<i>B. cereus</i>)	129	66;96 (re-swabbed this to verify 1st low result)	4.5 x 10 ³	38	0
Daily Cleaning Protocol + Deep Cleaning Protocol					
Location (Inoculant)	ATP after UV only	Culture after UV only in above table	ATP after deep cleaning protocol wash	Culture after deep cleaning wash	
H1 (<i>S. epi</i>)	455	0	22	0	
B1 (<i>E. coli</i>)	259	0	18	0	
B2 (<i>B. cereus</i>)	38	0	10	0	
Deep Cleaning Protocol					
Location (Inoculant)	ATP Baseline	ATP after inoculation	Culture after inoculation	ATP after deep cleaning wash	Culture after deep cleaning wash
H1 (<i>S. epi</i>)	163	6447	4 x 10 ⁶	9	0
B1 (<i>E. coli</i>)	136	1292	1.8 x 10 ²	7	0
B2 (<i>B. cereus</i>)	61	1294	4	8	0



- After Daily Cleaning Protocol was complete, ATP measurements decreased 57-63% (38 to 455 RLUs).
- After Deep Cleaning Protocol was complete, ATP measurements decreased 99% (7 to 9 RLUs).
- After Daily Cleaning Protocol plus Deep Cleaning Protocol was complete, ATP measurements decreased 74-95% (10 to 22 RLUs).
- All cultures from each round of cleaning showed **no growth** after 48 hours.

Conclusions

- Our established cleaning protocols for an animal robot in the ICU are effective.
- When cleaned according to the protocols, the infection risk associated with the clinical use of an animal robot is remarkably decreased.
- Regarding infection control, the animal robot is considered safe to use with critically ill patients.
- **Patients who are critically ill can benefit from the physiological and psychological benefits of AAI, without an increased risk of infection.**

Contact

Breanna Hetland, PhD, RN, CCRN-K
Breanna.Hetland@unmc.edu

 : therapy.seal
 : Doc_Het