



Environmental Cultures of Hyperbaric Chambers and Treatment Areas

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*Kayla Deru
Lindell Weaver, MD
Geness Koumandakis, RRT
Susan Churchill, APRN-NP*

Disclosures and Acknowledgements

- I have no relevant financial relationships with ineligible companies, whose primary business is producing, marketing, selling, re-selling, or distributing healthcare products used by or on patients, to disclose.
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 - **Bert Lopansri, MD**
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Introduction

- We treat patients with infections
 - Methicillin-resistant Staph. Aureus (MRSA)
 - Vancomycin-resistant Enterococcus (VRE)
 - C. difficile
 - Resistant gram-negative bacteria – Pseudomonas, Klebsiella, Acinetobacter, and others
- We treat patients who are immunosuppressed or medically complex
- Opportunity for patient→patient or staff→patient transmission of drug-resistant organisms

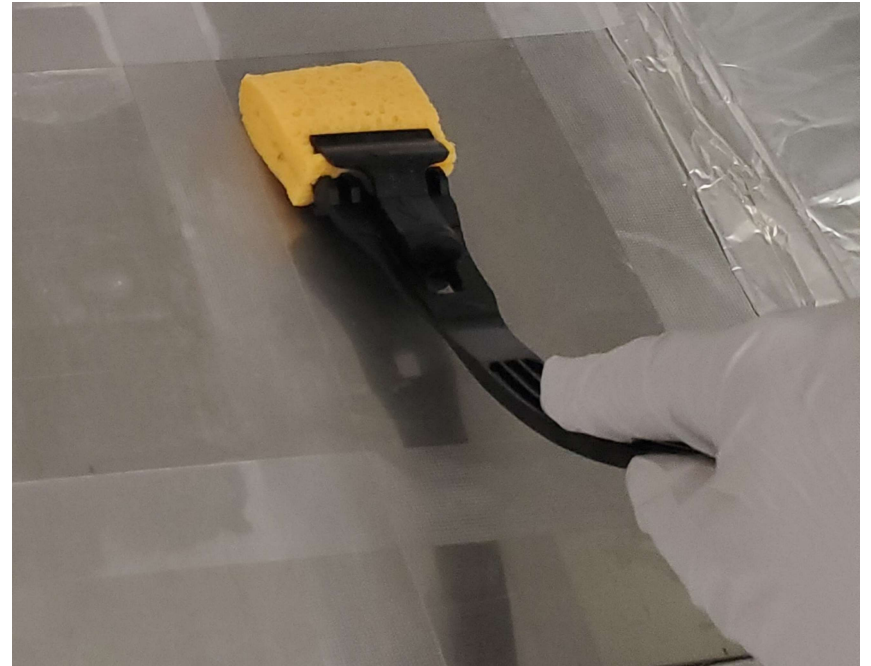
Introduction

- Are we doing what we can to prevent nosocomial infections?
 - Hand hygiene
 - Cleaning equipment and patient contact surfaces
- CDC: environmental cultures can be part of a comprehensive infection control plan to identify:
 - “potential environmental reservoirs of pathogens”
 - “survival of microorganisms on surfaces”
- **Should not be undertaken without willingness to change practice**

Sehulster LM, et al. Guidelines for environmental infection control in health-care facilities. Available at:
<https://www.cdc.gov/infectioncontrol/guidelines/environmental/index.html>

Methods

- Sponge stick collection
- Organisms grown in TSB
- Plated on selective media
 - MRSA
 - VRE
 - C. diff
 - Cefotaximine-resistant GNR
- Plated on non-selective media
 - Total counts of colony-forming units



Methods – Collection Sites

- 2 hospital-based facilities staffed by 1 team
- All sites cultured “clean” (per our standard cleaning procedures)
 - Full wipe-down of monoplace interior/mattress and all multiplace patient-touch surfaces after every patient
- Hyperbaric chambers (6 mono, 1 multi), interior and exterior
- Medical equipment (vital signs, ventilators/pumps, otoscope, etc.)
- High-touch surfaces in changing, examination, and staff areas
- 161 culture sites



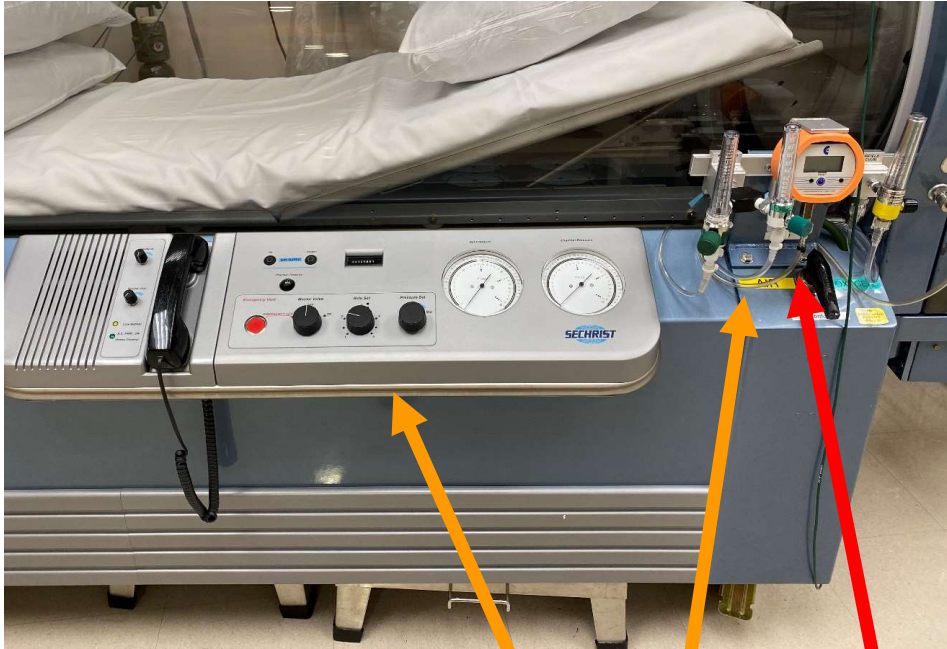
MRSA



GNR



C. diff



GNR

VRE



MRSA



VRE



GNR

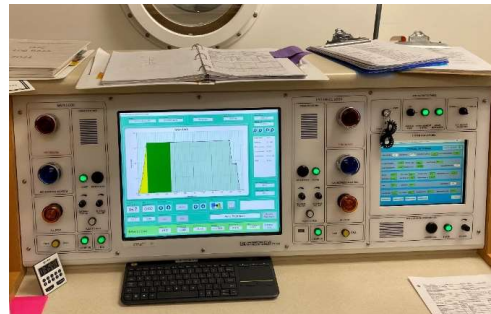


GNR

**All GNR organisms identified as
Pseudomonas or Acinetobacter
species**

Other Highly Contaminated Sites

> 260 cfu on blood auger plate → > ≈4000 cfu per standardized sample



Actions After Culture Results

- Immediate one-time “terminal clean” of both departments
- Regular laundering of privacy curtains/chamber covers
- Retrained our staff on regular cleaning procedures
- Changes to cleaning schedules
 - All exterior monoplace touch surfaces after every patient use
 - Scale, vitals chair after every patient use
 - Daily cleaning remote controls, water dispenser
 - Weekly cleaning of patient lockers, logbook, treatment area chairs and workstations
 - Monthly deep clean of gurneys, monoplace chamber gaskets
- Plastic chart covers

Repeat Cultures – 18 months later

- Planned to resample immediately after practice changes – delayed by COVID
 - Restricted patient volumes
 - ID personnel redeployed
- Focus on high-yield surfaces and those that would be impacted by cleaning changes
- 100 samples vs 161



C. diff



VRE



GNR



Isolated GNRs were Raoultella, Acinetobacter, Achromobacter, Citrobacter, Pseudomonas, Enterobacter

What's Working, What's Not

Numbers represented as CFUs (colony-forming units) per standardized sample

No standards for healthcare, but food service standards are <50 cfu/sample

- No MRSA (perhaps no active infection), fewer sites with GNR
- Monoplace gaskets down 88%: 8225 vs 958
- Gurneys are cleaner, but not clean enough: 6728 vs 3397
- No change to “clean” multiplace chairs: 3043 vs 2926
- Personal workstations are dirtier: 2646 vs 4120
- Mixed results on chamber covers and curtains
 - Facility 1: quarterly cleaning – 2133 vs 689
 - Facility 2: washed once – 644 vs 1660

Conclusions

- No known cases of nosocomial spread among patients in our departments
- Resistant organisms are present
- Training to standard did not improve cleanliness - targeted changes to process did