

Review of Environmental Culturing - The Market Banks

Collection Date:

For purposes of evaluating cleanliness, Evaclean uses the Mulvey¹ findings for determining a benchmark. The current quantitative standards for aerobic colony counts (ACC) on surfaces/hand touch sites should not exceed 2.5 cfu/cm². The qualitative standard states that any pathogen isolated should be <1 cfu/cm².

Samples were taken without cleaning from two surfaces²:

- a. Table
- b. TV Remote Control

Both surfaces where then sprayed with PURTABS, NaDCC, at a concentration of 4306 ppm. After the disinfectant was allowed to air dry, culture samples were taken of both surfaces.

| Surface | Pre-Clean Swab | CFU/Growth | Post-Spray Swab | CFU |
|---------|---|---------------|-----------------|-----|
| Table | Staphyloccoccus epidermis Pantoea species | 1 | No growth | 0 |
| Remote | Staphyloccoccus epidermis | In thio Broth | No growth | 0 |

Disinfecting the surfaces with PURTABS resulted in no growth of bacteria.

¹ D. Mulvey, et. al., Finding a Benchmark for Monitoring Hospital Cleanliness, *Journal of Hospital Infection 77* (2011) 25-30.

² See "Final Report" CD Laboratories

BACTERIAL FINDINGS

Pantoea Species

Pantoea agglomerans (formerly Enterobacter agglomerans) is a motile peritrichous, non-sporeforming, Gram-negative aerobic bacilli in the Enterobacteriaceae family (1, 2). It is commonly found in the ecological niches such as water, soil, sewage, seeds, vegetables, feculent material and foodstuffs, as well as reported as both commercial and opportunistic pathogens of animals and humans (3, 4). This opportunistic pathogen isolated from clinical specimens including blood, wounds, urine, throat, and internal organs (5).

- P. agglomerans is recognized as a plant pathogen. In the mid-1960s it was identified in nosocomial infections ($\underline{6}$, $\underline{7}$). P. agglomerans is the most frequent species associated with human infections ($\underline{1}$, $\underline{8}$). Hospital outbreaks due to contamination of anesthetic agent propofol, blood products, parenteral nutrition, and transference tubes used for intravenous hydration have been demonstrated ($\underline{8}$, $\underline{9}$, $\underline{10}$).
- *P. agglomerans* has been implicated in pneumonia, wound infections, septicemia, bacteremia, urinary tract infection, meningitis, lung and brain abscess, septicemia, osteomyelitis, septic arthritis, peritonitis and colelithiasis. The organism is generally regarded as opportunistic, of low virulence, low degree of toxicity and with little intrinsic invasiveness but can cause infection even in the healthy individuals with immunocompetent system (11, 12).
- P. agglomerans is causative agent of infection in children and elderly persons.

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Staphylococcus epidermidis

Whereas previously only regarded as an innocuous commensal microorganism on the human skin, Staphylococcus epidermidis is nowadays seen as an important opportunistic pathogen. It is now the most frequent cause of nosocomial infections, at a rate about as high as that due to its more virulent cousin Staphylococcus aureus¹. In particular, S. epidermidis represents the most common source of infections on indwelling medical devices. This likely stems from the fact that S. epidermidis is a permanent and ubiquitous colonizer of human skin, and the resulting high probability of device contamination during insertion². While S. epidermidis infections only rarely develop into life-threatening diseases, their frequency and the fact that they are extremely difficult to treat represent a serious burden for the public health system. The costs related to vascular catheter-related bloodstream infections caused by S. epidermidis amount to an estimated \$2 billion annually in the United States alone³⁻⁵. Treatment is complicated by specific antibiotic resistance genes and the formation of biofilms, multicellular agglomerations that have intrinsic resistance to antibiotics and mechanisms of host defense³. Furthermore, recent investigation has identified specific molecular determinants facilitating S. epidermidis immune evasion and ability to cause chronic disease.

Staphylococci are common bacterial colonizers of the skin and mucous membranes of humans and other mammals⁴. S. epidermidis in particular is the most frequently isolated species from human epithelia. It colonizes predominantly the axillae, head, and nares⁵.

S. epidermidis belongs to the group of coagulase-negative staphylococci (CoNS), which is distinguished from coagulase-positive staphylococci such as S. aureus by lacking the enzyme coagulase. The species shows a high degree of diversity with 74 identified sequence types (STs)⁶.

Among CoNS, S. epidermidis clearly causes the greatest number of infections^{2,2}. In clinical microbiology, CoNS are often not further specified, as the major interest is in making a distinction between S. aureus and other staphylococci. However, based on reports that have performed species identification^{1,2}, one can assume that the vast majority of non-specified CoNS infections are due to S. epidermidis. Particularly, S. epidermidis represents the most frequent causative agent involved with infections of any type of indwelling medical devices, such as peripheral or central intravenous catheters (CVCs)². These infections usually commence with the introduction of bacteria from the skin of the patient or that of health care personnel during device insertion and have increased in number most likely owing to the increased use of such devices^{1,18}. S. epidermidis now accounts for at least 22% of bloodstream infections in intensive care unit patients in the USA, which occur in at least 4–5/1000 CVC insertions^{1,18}.

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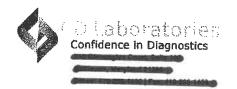
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Conclusion

Cleaning of high touch point surfaces has been insufficient in completely eliminating bacterial counts. Enhanced disinfection using NaDCC demonstrated no bacterial growth after 48 hours. The recommendation is to add enhanced disinfection to daily general cleaning in the common areas.

Disinfection should be done on a daily basis during the night shift using a 4306 PPM concentration of NaDCC. Evaluation of additional surfaces should be conducted on a monthly basis or until CFU p/cm² is achieved.



M

QD

FINAL REPORT

Patient Name:

Date of Birth: Gender:

Age: Unit:

Room/Bed:

Accession #:

Collection Date:

Received in Lab: Resulted Date:

09:00

Ordering Phys.: # Organization:

Comments

Test Name

Result

Units

Flag

Ref. Range

Site

CULTURE, ENVIRONMENTAL

Result

SEE COMMENTS

Site:

Table A

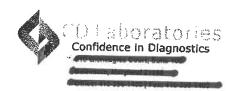
Organism 1: Staphylococcus epidermidis

Growth:

Organism 2: Pantoea species

Growth:

1 CFU



FINAL REPORT

Patient Name:

Date of Birth: Gender:

Age:

0D

Unit: Room/Bed:

Accession #: Collection Date:

Received in Lab: Ordering Phys.:

11:43

10:29

Organization;

Comments

Test Name

Result

Units

Flag

Ref. Range

Site

CULTURE, ENVIRONMENTAL

Result

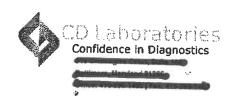
SEE COMMENTS

Site:

Table B

Culture results:

No growth after 48 hours:



FINAL REPORT

Patient Name:

Date of Birth: Gender:



Age:

Unit:

Room/Bed:

Accession #:
Collection Date:
Received in Lab:
Resulted Date:
Ordering Phys.:
Organization:



Comments

Test Name

Result

Units

Flag

Ref. Range

Site

CULTURE, ENVIRONMENTAL

Result

SEE COMMENTS

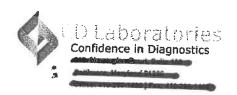
Site:

Remote A

Organism 1: Staphylococcus epidermidis

Growth:

In Thio Broth



FINAL REPORT

Patient Name

Date of Birth: Gender:



Age: Unit:

Room/Bed:

Accession #:**
Collection Date: Received in Lab: Resulted Date: Ordering Phys.: Organization:



Comments

Test Name

Result

Units

Flag

Ref. Range

Site

CULTURE, ENVIRONMENTAL

Result

SEE COMMENTS

Site:

Reomte B

Culture results:

No growth after 48 hours.