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Review of Environmental Culturing – [redacted]

Collection Date: [redacted]

For purposes of evaluating cleanliness, Evaclean uses the Mulvey[1] 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 surfaces[2]:

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 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 (6, 7). *P. agglomerans* is the most frequent species associated with human infections (1, 8). Hospital outbreaks due to contamination of anesthetic agent propofol, blood products, parenteral nutrition, and transference tubes used for intravenous hydration have been demonstrated (8, 9, 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 aureus*[1]. 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 insertion[2]. 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 alone[3–5]. 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 defense[3]. 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 mammals[4]. *S. epidermidis* in particular is the most frequently isolated species from human epithelia. It colonizes predominantly the axillae, head, and nares[5].

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, 9]. 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, 5], 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)[9]. 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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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/cm^2 is achieved.

Laboratories
Confidence in Diagnostics
[redacted]

FINAL REPORT

Patient Name: [redacted]
Date of Birth: [redacted]
Gender: M
Age: 0D
Unit:
Room/Bed:

Accession #: [redacted]
Collection Date: [redacted]
Received in Lab: [redacted] 11:42
Resulted Date: [redacted] 09:00
Ordering Phys.: [redacted]
Organization: [redacted]

Comments

Test Name	Result	Units	Flag	Ref. Range	Site

CULTURE, ENVIRONMENTAL

Result

SEE COMMENTS
Site:
Table A

Organism 1: Staphylococcus epidermidis
Growth: 1 CFU

Organism 2: Pantoea species
Growth: 1 CFU

*** FINAL REPORT ***

Current Print [redacted]
First Printed [redacted]

Laboratories
Confidence in Diagnostics

FINAL REPORT

Patient Name: [redacted]
Date of Birth: [redacted]
Gender: M
Age: 0D
Unit:
Room/Bed:

Accession #: [redacted]
Collection Date: [redacted]
Received in Lab: [redacted] 11:43
Resulted Date: [redacted] 10:29
Ordering Phys.: [redacted]
Organization: [redacted]

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 ***

Current Print [redacted]
First Printed [redacted]

CD Laboratories
Confidence in Diagnostics
[redacted]

FINAL REPORT

Patient Name: [redacted]
Date of Birth: [redacted]
Gender: [redacted]
Age: 0D
Unit:
Room/Bed:

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

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 ***

Current Print [redacted]
First Printed [redacted]

ARUP Laboratories
Confidence in Diagnostics
[redacted]

FINAL REPORT

Patient Name: [redacted]
Date of Birth: [redacted]
Gender: [redacted]
Age: 0D
Unit:
Room/Bed:

Comments

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

Test Name	Result	Units	Flag	Ref. Range	Site

CULTURE, ENVIRONMENTAL

Result

SEE COMMENTS
Site:
Reomte B

Culture results:
No growth after 48 hours.

*** FINAL REPORT ***

Current Print [redacted]
First Printed [redacted]