Biofilm Analysis of MARCoNS Positive Cultures and Its Clinical Implications

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ABSTRACT

Background Information

A bacterial biofilm is a structured community of microorganisms encased in an exo-polysaccharide (EPS) or exo-polymeric substance which adheres to an inert or living surface. Biofilms may be polymicrobial and may consist of not only bacterial cells but also fungi, viruses, proteins, extracellular DNA and other biogenic factors. Biofilm bacterial cells are different than free-living, planktonically growing bacteria, in that they are non-motile (sessile) and have reduced metabolic activity. This reduced activity increases antimicrobial tolerance because many classes of antibiotics are only effective against actively dividing cells by targeting peptidoglycan produced in the cell wall (B-lactams), protein synthesis (Aminoglycosides), or DNA replications (Quinolones). Biofilm is a mechanical barrier to antimicrobials and immune system cells, which decreases their effectiveness. Stimulation of the immune system without eradicating the infection causes collateral damage to surrounding tissue and chronic inflammation (12).

Dutch scientist Antonie van Leeuwenhoek first described biofilms found in his own dental plaque (1684). The term biofilm was first used in a publication in 1975 according to Montana State University's Center for Biofilm Engineering. Biofilm tolerance to antibiotics is at least twice and perhaps, as much as, 1000 times stronger than normal planktonic bacteria. Because many cells deep within a biofilm are nutrient and oxygen starved, they grow fairly slower. Biofilm contains persister cells which lie dormant when antibiotics are present, then move into action when antibiotic treatment has ended (13).

In 1982, G.D. Christensen published the first method used to detected biofilm produced by Coagulase Negative Staph (2). Many publications since then have stated that biofilm producing bacteria are notoriously difficult to eradicate (2 – 11).

Methods

MDx has developed a biofilm method based upon the original method of Christensen but modified, to yield a semi-quantitative photometric result for better classifying the level of biofilm produced. Data will be shown to validate the method and a comparison to clinical isolates by the tissue culture plate reference method will be summarized. Advantages of the MDx method versus the reference method will be provided.

Results

The MDx method compares favorably to the reference method is more convenient and more sensitive in its detection ability.

Discussion

The biofilm analysis of a strong biofilm producing MARCoNS may explain some of the therapeutic failures. A consideration of the different strains of Coag Negative Staph before and after treatment may be explained by understanding the effect of biofilms.

Conclusion

Biofilm of MARCoNS may provide information for enhanced patient treatment.

Learning Objectives

Understand the clinical implications of biofilm formation for MARCoNS.
Understand the importance of the many different strains of Coag Negative Staph, the interpretation of the lab report and their effect on patient treatment.

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