C53 Analysis of Bioaerosol Samples

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Upon completion of this presentation, participants will be familiar with the methods available for the analysis of air and surface samples. Participants will have an understanding of the advantages and limitations of various approaches to sample analysis, the compatibility of analysis methods with sampling methods used, and the factors to be considered in developing a monitoring plan for measuring the concentration and composition of airborne microorganisms and biocontamination sources.

The Microbiology Division of the Harry Reid Center for Environmental Studies has been involved in bioaerosol research for over twenty years and has extensive expertise and peer-reviewed publications in this area. As a result, this presentation will impact the forensic science community by providing the most current and relevant information to maximize the utility of the presentation to professionals in the forensic community that are interested in air and surface sampling and analysis.

Respiratory exposure to certain pathogenic or toxigenic microorgan- isms and/or elevated concentrations of airborne environmental organisms could result in adverse health effects, such as allergic reactions, irritant responses, toxicosis, and respiratory illness. Determination of the concen- tration and composition of bioaerosols and their sources in indoor environ- ments is necessary for assessment of contamination levels and to estimate potential exposure of occupants. The need for accurate measurement of bioaerosols has received increased attention in recent years owing to concerns with mold contamination in indoor environments and the threat of bioterrorism. Unfortunately, standardized sampling and analysis protocols are lacking, and human exposure limits have not been established for bioaerosols. In addition, there are limited exposure, dose, and response data that are necessary for applying sampling results for risk assessment. Sample analysis methods include culture, microscopic, biochemical, immunologi- cal, and molecular biological assays. Traditionally, airborne microorgan- isms have been analyzed by culturable and microscopic total count determinations. However, there are limitations to both of these methods. For example, culture analysis is limited to only those microorganisms that can be cultivated on artificial growth media and those that are culturable may take days or weeks to grow. Microscopic enumeration can be laborious, lacks sensitivity and requires special techniques or expertise to identify microorganisms. The limitations of traditional methods have led to the development and application of other techniques that can increase the sen- sitivity and accuracy of bioaerosol monitoring. The selection of an analysis method is a critical component of a bioaerosol sampling plan, and it should be designated before air sampling is conducted. Factors which influence the choice of an analytical method include the cost and length of time required for analysis, the sensitivity and specificity of the analysis method, the sam- pling methods to be utilized, and the expected characteristics of the bioaerosol of interest. The purpose of this presentation is to provide an overview of available methods for the analysis of bioaerosols and surface samples, including traditional methods and emerging technologies designed to enhance monitoring of bioaerosols, such as polymerase chain reaction (PCR), biochemical, and immunological assays. The advantages and limita- tions of various sample analysis approaches will be discussed. The use of real-time quantitative PCR will be emphasized.

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