

Desafios da avaliação da exposição ocupacional a agentes microbiológicos

Challenges of occupational exposure assessment to bioburden

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Resumo

São vários os desafios que o higienista ocupacional terá que superar para conseguir avaliar a exposição ocupacional aos agentes microbiológicos. A selecção dos métodos de amostragem, com o intuito de colher amostras representativas da exposição e, ainda, a escolha dos melhores métodos de análise são sem dúvida actividades críticas para o alcance da caracterização deste risco. O conhecimento das limitações dos resultados obtidos é crucial para a sugestão das mais adequadas medidas preventivas e correctivas, que visam a minimização da exposição ocupacional.

Serão disponibilizadas informações sobre os métodos de amostragem para a avaliação da exposição aos agentes microbiológicos, bem como as vantagens de utilizar, em paralelo, a microbiologia clássica e as ferramentas moleculares.

Palavras-chave: Avaliação; Exposição ocupacional; Agentes microbiológicos; Caracterização do risco

Abstract

Several challenges have to be overcome by an occupational hygienist to assess occupational exposure to bioburden. Selection of the sampling methods to obtain representative samples of exposure and also the assays to be performed is a critical task to achieve this risk characterization. Results constraints should be known to suggest the most suitable preventive and corrective measures, aiming to minimize occupational exposure.

Information about on what is currently known concerning sampling methods to achieve bioburden exposure assessment will be provided and the features of combining culture-based methods and molecular tools on this pursuit will be presented.

Keywords: Assessment; Occupational exposure; Bioburden; Risk characterization

1. Theory

Airborne microorganisms might pose an occupational hazard when present in high concentrations in occupational environments resulting in health

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problems (Stetzenbach, Buttner & Cruz, 2004). Bioburden (comprising fungi and bacteria burden) composition and viability are influenced mainly by the building characteristics, comprising the availability of water and nutrients for growth and survival, the buildings' occupants, activities performed and the outdoor environment (Committee on Microbiomes of the Built Environment, 2017). Therefore, exposure to bioburden is a critical occupational issue that needs close attention (Wang et al., 2015).

The workers in different settings, such as health care, agriculture, animal production, waste, fishery, forestry, mining, construction, and day care are exposed to higher risks of bioburden exposure because of the work characteristics (Wang et al., 2015; Viegas et al., 2015). Numerous studies have indicated that these workers have higher prevalence rates of respiratory health problems (Heldal et al., 2003; Bang et al., 2005; Heederik et al., 2007; Cox-Ganser et al., 2009).

Of note, is the uniqueness of each bioburden sample as its composition varies in time and space (abundance and diversity of species) (Oppliger, 2014). Thus, exposure assessment to bioburden remains to be a challenging task for every industrial hygienist. Occupational exposure to bioburden can be estimated using a variety of different sampling methods (active and passive) and analyses (culture based and molecular tools) and each situation is unique and requires specific methodology (Oppliger, 2014; Viegas et al., 2015).

Concerning sampling methods, it was already reported the advantages to have a multi-approach on sampling methods to be applied (Viegas et al., 2017, 2018). We should engaged not only more than one active method for air sampling, but also use in parallel passive methods, such as surface swabs to obtain a more accurate risk characterization (Viegas et al., 2017). Passive methods will allow determining the contamination levels from a larger period of time (weeks to several months), whereas air samples can only reflect the load from a shorter period of time (mostly minutes) (Viegas et al., 2015).

Combining culture based-methods and molecular tools to characterize the bioburden risk of exposure will allow: by using culture-based methods to obtain information about the infection potential of the bioburden present (Hung, Miller & Dillon, 2005) and comparing quantitative information with guidelines; by applying molecular tools to target specific species indicators of harmful bioburden and to overcome some culture-based methods constraints (Viegas et al., 2017). Even the next-generation sequencing (NGS) is a qualitative method, and to get a better understanding of the bioburden exposure, the concentration must be assessed using culture-based methods and molecular biology methods such as qPCR (Degeois et al., 2017).

2. Conclusion

Information about on what is currently known concerning sampling methods to achieve bioburden exposure assessment will be provided and the features of combining culture-based methods and molecular tools on this pursuit will be presented.

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