Appl Environ Microbiol. 2009 Dec;75(24):7655-62. doi: 10.1128/AEM.00928-09. Epub 2009 Oct 16.

Assessment of the total inflammatory potential of bioaerosols by using a granulocyte assay

Timm M, Madsen AM, Hansen JV, Moesby L, Hansen EW

Abstract

Occupational health symptoms related to bioaerosol exposure have been observed in a variety of working environments. Bioaerosols contain microorganisms and microbial components. The aim of this study was to estimate the total inflammatory potential (TIP) of bioaerosols using an in vitro assay based on granulocyte-like cells. A total of 129 bioaerosol samples were collected in the breathing zone of workers during their daily working routine at 22 biofuel plants. The samples were analyzed by traditional assays for dust, endotoxin, fungal spores, (1-->3)-beta-d-glucan, total number of bacteria, the enzyme N-acetyl-beta-d-glucosaminidase (NAGase; primarily originating from fungi), Aspergillus fumigatus, and mesophilic and thermophilic actinomycetes; the samples were also assayed for TIP. In a multilinear regression four factors were significant for the TIP values obtained: endotoxin ($P < 0.0001$), fungal spores ($P < 0.0001$), (1-->3)-beta-d-glucan ($P = 0.0005$), and mesophilic actinomycetes ($P = 0.0063$). Using this model to estimate TIP values on the basis of microbial composition, the correlation to the measured values was $r = 0.91$. When TIP values obtained in the granulocyte assay were related to the primary working area, we found that bioaerosol samples from personnel working in straw storage facilities showed high TIP values (approximately 50 times the TIP of unstimulated controls). In contrast, bioaerosol samples from personnel with work functions in offices or laboratories showed low TIP values (approximately 5 times the TIP of the unstimulated control). This indicates, as expected, that these areas were less contaminated. In conclusion, the granulocyte assay reacts to multiple contaminants in the environmental samples and can be used to obtain a measurement of TIP. Therefore, potential occupational health effects related to inflammation of the airways in a working environment can be estimated using this assay.

PMID: 19837831

Source: http://www.ncbi.nlm.nih.gov/pubmed/?term=19837831