Sampling of high amounts of bioaerosols using a high-volume electrostatic field sampler - DTU Orbit (28/07/2019)

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For studies of the biological effects of bioaerosols, large samples are necessary. To be able to sample enough material and to cover the variations in aerosol content during and between working days, a long sampling time is necessary. Recently, a high-volume transportable electrostatic field sampler for collection of fine particles has been described. The aim of this study was to investigate whether this sampler can be used for collection of high amounts of authentic bioaerosols that can subsequently be used for biological analysis. The investigation was carried out at a biofuel plant in a straw storage room and in a boiler room over two seasons. The sampled dust was quantified in terms of mass and characterized regarding microbial components and compared with dust sampled by Gravikon and GSP samplers. For the electrostatic field sampler, a prefilter was used to remove large objects. The prefilter was characterized for particle penetration and this testing indicated that the prefilter did not remove particles up to 10 μm, and therefore respirable dust was sampled by the electrostatic field sampler. Using the electrostatic field sampler in the straw storage and in the boiler room, 330 and 315 mg dust (net recovery of the lyophilized dust) was sampled during a period of 7 days, respectively. The sampling rates of the electrostatic field samplers were between 1.34 and 1.96 mg dust per hour, the value for the Gravikon was between 0.083 and 0.108 mg dust per hour and the values for the GSP samplers were between 0.0031 and 0.032 mg dust per hour. The standard deviations of replica samplings and the following microbial analysis using the electrostatic field sampler and GSP samplers were at the same levels. The exposure to dust in the straw storage was 7.7 mg m⁻³ when measured by the electrostatic field sampler and 11.8 mg m⁻³ when measured by the GSP inhalable dust sampler. The quantity (amount per mg dust) of total fungi, Aspergillus fumigatus, total bacteria, endotoxin and mesophilic actinomycetes sampled by the electrostatic field samplers and the Gravikon samplers varied within the same season by a factor smaller than four. The quantities of some microbial components were higher in the dust collected with all samplers in March than in August. In conclusion, by using the electrostatic field sampler, it was possible to sample replicas of large authentic aerosol samples that can be used, e.g. biological analysis. (Sharma AK et al., 2007a).

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