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Bioaerosol production from routine activities within a hospital ward

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Introduction

The ability of a human to shed bacteria, including the pathogen *Staphylococcus aureus* on skin particles during activities has been well documented by many authors (e.g. Davies and Noble, 1962). The majority of these studies consider only specific activities, often in controlled conditions and for short time periods. To understand how these releases may impact on infection control it is necessary to understand how the bio-aerosol concentration fluctuates with activities on a typical day in a hospital ward. For this reason the authors carried out a scoping study in 2004 on a respiratory ward and found large variation with bio-aerosol concentrations over the day (Roberts et al., 2006). The current work builds on this previous study and aims to establish whether the activity of staff on a ward can be statistically correlated to bio-aerosol concentrations. Fluctuations on multiple days are compared in order to identify typical patterns of release.

Methods

The study was carried out over seven days on a 4 bed bay of a respiratory ward between 8am and 4pm. The air was sampled to determine a total viable count of bacteria using a Micro-bio MB2 sampler. Particles in five size ranges; 0.3-0.5 μm , 0.5-1 μm , 1-3 μm , 3-5 μm and >5 μm , were sampled using a Kanomax laser particle counter. The particles were summed over 15 minute periods. Within this same period the number of hospital staff within the bay were summed and multiplied by the number of minutes present. Bio-aerosols were sampled for 5 minutes at the end of each 15 minute period.

Results

The results presented here consider the three days on which ward cleaning was not carried out. Figure 1 shows the number of hospital staff in the bay with the total viable count of sampled airborne bacteria over 2.5 sampling days. The statistical analysis used Spearman's Rho correlation test since the data was not normally distributed. There is a statistical similarity between the activity and bio-aerosols ($r=0.522$; $p<0.01$; $n=38$) shown clearly in Figure 1 with peaks of both in the morning, tailing off into the afternoon. The fluctuation of bio-aerosols was found to be similar to that of particles sized >5 μm ($r=0.77$; $p<0.01$; $n=35$). The two full days show a statistically similar pattern of bio-aerosol fluctuation ($r=0.52$; $p<0.05$; $n=16$).

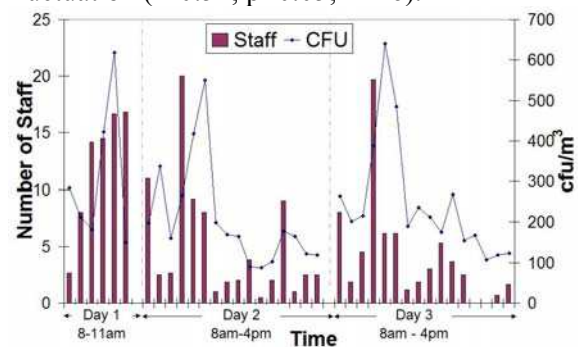


Figure 1. Fluctuation of number of staff in the bay and the quantity of sampled bio-aerosols.

Conclusions

There are high peaks of bio-aerosols and particles > 5 μm during the morning when there is more activity, quantified here by the number of staff in the bay. This is seen on all the days.

Davies R.R., Noble W.C. 1962. Dispersal of Bacteria on Desquamated Skin. *Lancet* **2**(7269): 1295.

Roberts K. et al. 2006. Bioaerosol production on a respiratory ward. *Indoor and Built Environment* **15**(1): 35-40.