Indoor dust as a template to assess indoor aerosol bacteria contamination

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The exposure of occupants of housing to indoor air pollutants has increased significantly in recent decades. Energy policy and insulation of buildings have largely contributed. This pollution poses a serious public health issue. Besides the chemical pollutants, gases, particulates and allergens, very studied (Awad et al., 2013) the contribution of mold in respiratory problems is well established. But among microbiological contaminants, bacterial bioaerosols remain poorly studied (Kettleson, et al., 2015) and their roles in respiratory problems need to be studied.

To address this issue it is first necessary to assess the exposure to indoor air bacteria. However, the lack of valid tools for standardization to quantitatively assess exposure to environmental bacteria is one of the main challenges for better understanding the role of these bacterial bioaerosols on human health. This study is looking for a more appropriate method to measure bacterial contamination and find a link between bacterial bioaerosols and the occurrence of respiratory disorders.
Scientific literature demonstrates the link between bacterial aerosol contamination and dust bacterial contamination (Rintala et al., 2012; Knibbs et al., 2011; Konya and Scott. 2014). As house dust can accumulate bacterial contamination and is easy to collect we were wondering of the fate of bacteria on this matrix. To adress this issue, we select a model of environmental gram negative bacteria and gram positive bacteria and study the fate of *Serratia marcescens* and *Staphylococcus epidermidis* in sterilized household dust. For this purpose, different dilutions of bacteria were harvested with house dust for different times (figure 1).

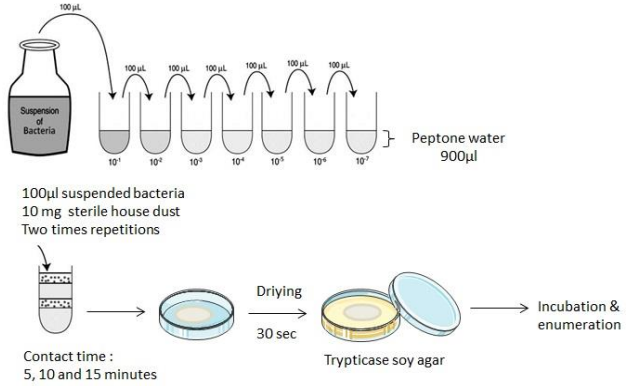

Figure 1: protocol of the study.

To 100 µl of suspended bacteria 10 mg of sterile house dust were added and this was repeated two times. After different contact times, the suspension was transferred filtered and the filter was dried for 30s and transferred to agar plate and incubate for one night, and enumerated.

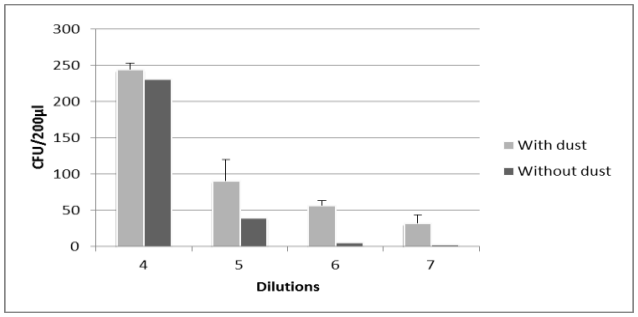

Figure 2: detection of *Serratia marcescens* with or without dust suspension (CFU/200µl).

Survival of bacteria is more important when they are associated to dust.

In conclusion, to study bacterial contamination indoor it is more interesting to investigate their presence in dust as this matrix support a more important survival of bacteria and can also accumulate the contamination over time.
Two bacterial species characterized by two types of Gram different and are commonly found in indoor environments were tested to determine the time required survival of these bacteria in contact with the household dust.

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A.H.A. Awad, S.G. Gibbs, P.M. Tarwater, M.E. Casillas, C.F. Green, Seasonal evaluation of fine and coarse culturable bacterial aerosols from residences within a rural and an urban city in Egypt, Int. J. Environ. Health Res. 23 (2013) 269–280.

E.M. Kettleson, A. Adhikari, S. Vesper, K. Coombs, R. Indugula, T. Reponen, Key determinants of the fungal and bacterial microbiomes in homes, Environ. Res. 138 (2015) 130–135. doi:10.1016/j.envres.2015.02.003.

H. Rintala, M. Pitkäranta, M. Täubel, 4 Microbial Communities Associated with House Dust, Adv. Appl. Microbiol. 78 (2012) 75.

L.D. Knibbs, C. He, C. Duchaine, L. Morawska, Vacuum cleaner emissions as a source of indoor exposure to airborne particles and bacteria, Environ. Sci. Technol. 46 (2011) 534–542.

T. Konya, J.A. Scott, Recent advances in the microbiology of the built environment, Curr. Sustain. Energy Rep. 1 (2014) 35–42.