Mass Transport of Deposited Aerosol Particles by Surface-to-Surface Contact and its Implications for Aerosol-Borne Disease Transmission

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The spread of deposited aerosol particles from one surface to another via contact transfer, is an important factor in assessing the exposure pathways of airborne contaminants. Surface to surface contact transfer is thought to be one of the mechanisms for the spread of infectious diseases.

A study was conducted with the aim of quantifying the mass transfer efficiency of deposited aerosol particles when selected surfaces come in contact. A matrix of four variables was investigated; different surface pairs, applied pressure, contact time and contaminant loading. Among these, the variable with the greatest influence on mass transfer efficiency was the choice of surface pairs. Two types of surfaces were investigated, two soft surfaces – 100 % cotton and synthetic fleece – and two hard surfaces – brass and plastic laminate. The lowest mass transfer efficiency was observed for transfer from contaminated fleece to plastic laminate, ~ 2 %, and the highest efficiencies were seen for transfers from the two hard surfaces, brass and plastic laminate, to fleece, 41 and 30 % respectively. Other observations include an increase in the mass transferred with increased surface roughness. An increase in the applied pressure between the two surfaces in contact leads to a step change in transfer efficiency, so that two pressure regimes can be identified, with a transition pressure between them that depends on surface type. Time of

contact and contaminant loading appear to have little to no effect on the mass transfer efficiency for the surfaces studied.

Overall, contact transfer efficiencies ranging from 2 to 45 % were observed; these are very significant numbers in terms of hazardous aerosol transport in the environment. These experiments were designed as an initial quantitative exploration using a limited number of surfaces and study variables.