Measuring Aerosol Particle Transfer Rates Between Surfaces for Exposure Evaluation

A. McDonagh[1], R. G. Sextro[2] and M. A. Byrne[1]

[1]*School of Physics and C-CAPS, ECI, National University of Ireland Galway, Ireland.*
[2]*Lawrence Berkeley National Laboratory, Berkeley, CA 94720, USA.*

Following an accidental or deliberate release of hazardous materials, such as radioactive or infectious species, to the atmosphere, there is a risk of exposure of large population groups and individual persons who reside both indoors and outdoors. Current dosimetric models focus on aerosol inhaled while initially airborne, with some reference to particles deposited on the human body, but secondary inhalation following resuspension is not considered. Additionally, there is a significant gap in published literature regarding the transfer of deposited contaminants between clothing and rigid surfaces (e.g. furnishings) via contact. The spread of particles by contact transfer is an important factor in assessing the pathway of contamination and is necessary in order to design effective countermeasures.

Experiments were carried out to quantify the percentage transfer of particles to and from hard and soft surfaces which are typically found in a home or office. Other variables investigated include the applied pressure, contact time and contaminant loading. The two soft surfaces chosen were 100% cotton, which a popular clothing fabric, and a synthetic fleece, which had a much rougher surface than the cotton. The hard surfaces chosen include plastic laminate and brass. The range of pressure values chosen correspond to pressures expected from resting a forearm on a desk, to sitting on a surface with full body weight.

Contact transfer percentages of approximately 2 – 45 % were observed, which are very significant values in terms of hazardous aerosol transport in the environment. 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 increased transfer, with a threshold pressure that depends upon the surface types. Time of contact and contaminant loading appear to have no effect on the percentage of deposited mass which is transferred by contact.