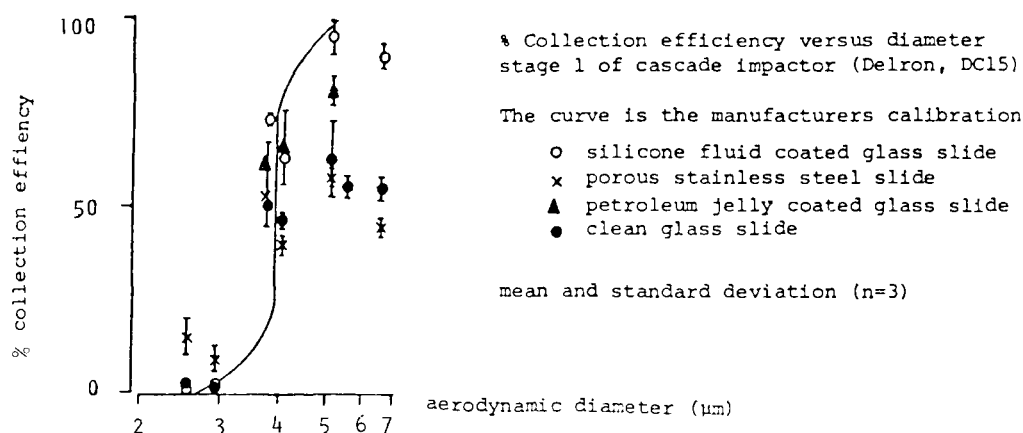


# CASCADE IMPACTION: THE PERFORMANCE OF DIFFERENT COLLECTION SURFACES

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It has been known for some time (Mercer & Stafford, 1969) that rebound of aerosol particles from collection surfaces in cascade impactors can be a serious drawback in using these devices for determination of aerodynamic particle size distributions of inhalation aerosols. Large errors may result from approximating the collection efficiencies by step functions whereby each stage is assumed to retain all particles above its 'cut-off' size as specified by manufacturers. We have therefore decided to establish experimentally the collection efficiencies for cascade impactors used in our studies.

Monodisperse particulate aerosols of disodium fluorescein (uranine) were prepared from methanolic solutions using a vibrating orifice generator (Berglund & Liu, 1973). After evaporation of the solvent, the electrostatic charge was removed with a  $^{85}\text{Kr}$  aerosol neutralizer (TSI 3054). The size and solid nature of uranine particles were examined microscopically. The collection efficiencies were determined by comparison of the amount of uranine recovered from the collection surface and a glass fibre filter downstream of the impactor stage. Typical results are shown in the figure together with the manufacturer's calibration curve.



The experimental collection efficiencies did not reach 100% for any of the surfaces examined. The most ideal surface appears to be the glass slide coated with silicone fluid (Dow Corning 200/60000).

It is concluded that: (i) unless a suitable coating is applied to the collection surfaces, the rebound of large particles onto lower stages of cascade impactors will lead to erroneous estimates of aerosol size distribution, (ii) in view of the deviations from the ideal step-function behaviour of even the 'best' surfaces, the calibration curves supplied by manufacturers should be used with caution.

This study was supported by an SRC CASE studentship in collaboration with ICI Pharmaceuticals Division.

Berglund, R. N. & Liu, B. Y. H. (1973). Environ. Sci. Technol., 7, 147-153.  
 Mercer, T. T. & Stafford, R. G. (1969). Ann. Occup. Hyg., 12, 41-48.