

# A NOVEL METHOD TO COMPARE HOUSE DUST MITE ALLERGEN REMOVAL AND RETENTION BY DIFFERENT VACUUM CLEANERS

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The main sensitiser and trigger for asthma is house dust mite (HDM) allergen. Removing HDM allergens in homes has been shown to be effective in reducing symptoms in asthmatic patients. Regular vacuum cleaning is important to decrease allergen reservoirs in homes. However, vacuum cleaning with an inefficient vacuum cleaner may do more harm than good. Many asthmatics suffer from asthma attacks either when vacuum cleaning, or when entering a room that has just been vacuumed, because HDM allergen may be physically pumped into the air from the vacuumed surface.

The observed increase in asthma rates in industrialised countries has not been unnoticed by the commercial world. Manufacturers are aware of a growing market for efficient cleaners and have identified the need to produce a device to retain HDM allergens. In response, there is a spectrum of vacuum cleaners on the market that incorporate high-efficiency particulate air (HEPA) filtration systems. Unfortunately, of the few studies aimed at testing their efficacy, none have been comprehensive or have attempted to measure both allergen uptake and retention for used, as well as new, vacuum cleaners.

We report our evaluation to test the performance of a range of vacuum cleaners, designed for asthmatics in homes, in terms of efficacy in removing allergens, in retaining allergen particles, and in limiting allergen dispersal during use. Two series of three experiments (10 replicates/vacuum cleaner, 7 vacuum cleaners, 3 experiments/series) were performed using new vacuum cleaners and then repeated using 'used cleaners' (where a fixed quantity of particulate and allergenic matter was vacuumed). Firstly we measured allergen release by placing the cleaners inside a sealed chamber, loading them with a known quantity of allergen, and collecting allergen released into the air from the vacuum cleaner using an air sampler. Allergen was quantified by enzyme-linked immunosorbent assay (ELISA). Secondly, we measured allergen uptake by loading a carpet tile with a known quantity of allergen, vacuum cleaned using a standard procedure, and determined the amount of allergen left on the carpet by ELISA. Thirdly, we quantified allergen disturbance during vacuuming by placing the vacuum cleaner in a sealed room, and taking four air samples around the head of the vacuum cleaner during vacuuming a known quantity of allergen from a carpet tile. ANOVA was performed on log-transformed data to reveal differences in performances between the types of vacuum cleaners and *t*-test analysis was performed to determine whether performance changed following 'usage'.