in which bedding is shaken, resulting in transient levels of allergen, we have developed an automated delivery system using a modified robotic vacuum cleaner. The prototype model has been shown to deliver steady particle levels and Fel d 1 levels consistent with those found in homes with cats. In the present work, we validate our working aerosolization system for two dispersion rates, and document the spatial and temporal distribution of aerosolised particles and Fel d 1 within the chamber.

Method: The robotic vacuum has been modified to vent aspirated dander into the air via a custom fit exhaust tube. Controlled remotely, it will move throughout the chamber (floor area = 15.1 m^2) for up to one hour, aerosolizing the dander that has naturally collected on the floor. Air samples will be obtained at various locations across the chamber using portable air sampling pumps (Gillian 5000) with glass fiber filters (Millipore). Fel d 1 deposited on the filters will be quantified using ELISA (Indoor Biotechnologies). Counts and sizes of dander particles will be measured using a time-of-flight particle size distribution analyser (PSD 3603, TSI Incorporated). Results will be evaluated for spatial distribution and temporal stability of Fel d 1 level, for two dispersion rates.

Results: A flow visualisation test, in which the robot aspirated and vented flour dust, revealed a turbulent round jet exiting the vacuum, having a strong core as high as 2 feet above the floor, and high concentrations of diffused particulate as high as 4 feet above floor level. Preliminary testing of the working model at the highest flow setting showed a higher number of large particles (>1 μm) being aerosolized compared to a prototype model, with the average particle size approximately 2 μm, compared to 0.8 μm for the prototype model.

Conclusion: The validation of a novel automated system for aerosolizing dander is expected to provide a means of better controlling subject exposure to animal dander for cat allergy studies, while maintaining a naturalistic environment.

TP1143 | Comparison of Methods for cat dander aerosolization

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Background: Historically, aerosolization of cat dander in natural exposure rooms is done by intermittently shaking bedding. However, this has resulted in widely variable Fel d 1 exposure. For the RMT Natural Exposure Chamber, we developed an automated aerosolization technique, using a filterless robotic vacuum cleaner that generates more stable particle levels. In this study we compare cumulative airborne Fel d 1 levels and aerosolized particle counts from this automated method, with and without the use of additional fans, to the blanket-shaking method.

Method: Dander aerosolization was performed for 30 minutes for each method; the vacuum was run continuously, while bedding was shaken vigorously for two minutes at 15-minute intervals. During the 30 minutes of aerosolization (or two 15-minute periods following blanket shaking) dander samples were collected using portable air sampling pumps (Gilian 5000) at 4 L/min with 2 μm glass fiber filters (Millipore). Fel d 1 was quantified using ELISA (Indoor Biotechnologies). Counts and size distributions of airborne particles were measured every three minutes during and for 15 minutes following aerosolization with a time-of-flight particle size distribution analyser (PSD 3603, TSI Incorporated)). Measurements were repeated on four separate days for each method.

Results: Despite having the lowest total particle (>2 μm)count (3.04×10^6 particles/m^3,, blanket shaking resulted in the highest Fel d 1 levels of the three methods (76 ng/m^3). It also had the highest standard deviation (30 ng/m^3), indicating comparatively low repeatability. The vacuum method with fans produced comparable Fel d 1 levels (65 ng/m^3) as well as the lowest standard deviation (8 ng/m^3) with a particle count of 4.58×10^6 particles/m^3. Vacuuming alone had the highest particle count (8.06×10^6 particles/m^3), but also the lowest Fel d 1 levels (43 ng/m^3), showing that the Fel d 1 level did not correlate to aerosolised particle count.

Conclusion: All methods produced Fel d 1 levels in the range of those in homes with cats. Particle counts surprisingly did not correlate to Fel d 1 level, suggesting the aerosolization of non-dander particles. Blanket shaking generated the highest average Fel d 1 level, but showed low repeatability. The vacuum method with fans showed the best stability and repeatability and met target Fel d 1 levels for matching “in-home” conditions.