SUNDAY

304 Quantified Environmental Challenge (QEC) Using Rubber Glove Cornstarch Aerosols Compromises Pulmonary Function in Patients With Natural Rubber Latex (NRL) Sensitivity

Santiago Quirce, Mark C Swanson§, M Fernández-Nieto*, M De Las Heras*, Javier Cuesta*, Joaquín Sastre** *Fundación Jiménez Díaz, Madrid, Spain §Mayo Clinic, Rochester, MN

Pulmonary function in NRL sensitized individuals is compromised by inhalation of quantifiable NRL aeroallergens. We conducted a study on 30 patients (28 were health care workers) with persistent asthma, which were exposed at work to NRL allergens. All patients but 2 had a positive skin prick test with a non-ammoniated NRL extract (ALK-Abelló, Spain). QEC with NRL aeroallergen aerosols was conducted in a 7 m^3-environmental challenge chamber. The chamber had vacuum exhaust and HEPA filtration. Latex aeroallergens were captured with a volumetric air sampler and polytetrafluoroethylene filters (Quan-Tec-Air, Inc., Rochester, MN). NRL aeroallergen concentrations were quantified by a competitive IgE immunoassay using sera from latex-sensitive individuals. NRL aeroallergens were aerosolized by the patients donning and doffing a pair of gloves every 3 minutes. The latex gloves had an average NRL allergen content of 208 µg/g. Nasal, ocular and respiratory symptom scores were recorded by using a semi-quantitative scale. Spirometry was also performed just before QEC, and thereafter at regular intervals for at least 9 hours. The duration of exposure was progressively increased (3, 5, 15, 30 and 60 minutes) until FEV_1 fell by 20% or more or a cumulative exposure of 114 minutes was completed. Twenty-seven patients (90%) had rhino-conjunctivitis, 19 patients (63%) had an asthmatic response and 1 patient had cough due to eosinophilic bronchitis on QEC with latex gloves. The asthmatic responses were immediate in 15 patients, dual in 3 patients, and isolated late response in 1 patient. The duration of exposures required to elicit asthmatic responses were: 3 minutes in 2 patients, 6 minutes in 5 patients, 15 minutes in 7 patients, 30 minutes in 2 patients and 60 minutes in 3 patients. Time weighted average NRL aeroallergen concentrations during QEC with patients having asthmatic responses ranged between 199 and 1,107 ng/m^3. The mean latex aeroallergen concentrations were not statistically different between the patients demonstrating asthmatic responses (639 ± 295 ng/m^3) or negative responses (611 ± 351 ng/m^3) to the challenge. The NRL aeroallergen concentrations measured at various time points of exposure were reproducible. Since NRL aeroallergen concentrations plateaued shortly after initiating the protocol, the total dose of NRL aeroallergen eliciting an asthmatic response was predominately determined by the duration of exposure. Recommended guidelines for workplace time weighted exposures to NRL have been described as <10 ng/m^3- low, no action necessary; 10-50 ng/m^3- moderate, further investigation and concern is warranted; >50 ng/m^3- immediate action including source identification and control measures are required.

305 The Vertical Distribution of Der p 1 Allergen in Carpets and the Effect of Vacuum Cleaning

Jason K Sercombe, Damien Liu-Brennan*, Euan R Tovey§* *Institute of Respiratory Medicine, Sydney, Australia §University of Sydney, Sydney, Australia

Carpets contain large amounts of indoor allergens, the most commonly studied being the dust mite allergen Der p 1. It is known that carpets vary in their Der p 1 content between different locations in a room. Little is known about the depth distribution of Der p 1 in carpets or the way in which vacuum cleaning affects this distribution. We investigated 7 used carpets from Sydney homes, all being greater than 5 years of age. Thirty sections measuring 5 cm × 10 cm were cut from each of the carpets in a random distribution from a 1m × 2m area, since it is known that the allergen content of carpets varies over small distances. Ten randomised sections per carpet were re-assembled into a continuous carpet and either: (a) left untreated (control), (b) vacuumed using an upright style household vacuum cleaner with powered brushes or (c) vacuumed using a canister style household vacuum cleaner without brushes. Carpet sections were then cut into 3 depth layers: the top 2 mm, the remainder of the carpet pile and the carpet base. These 3 layers were then weighed separately and assayed for Der p 1 content by ELISA. Dust collected by the vacuum cleaners from each carpet was also weighed and assayed. The mean concentrations of Der p 1 obtained from each layer varied considerably between the 7 untreated carpets. In the top 2mm layer Der p 1 concentrations were max = 1664.3, min = 191.5, median = 581.5 nanograms per gram. Similarly for the middle layer max = 2525.6, min = 328.2, median = 552.4, and for the carpet base max = 660.8, min = 30.5, median = 335.9 nanograms per gram. Thus the greatest concentration was in the top 2mm. Cleaning using either of the vacuum cleaners showed no significant ($p>0.05$) reduction in allergen concentration across all depth layers in six of the seven carpets. In the majority of layers of the carpets, vacuum cleaning led to no significant decrease in Der p 1 concentration. Some carpets showed an apparent increase in Der p 1 concentration in one or more layers following vacuum cleaning. This was seen with both types of vacuum cleaner, although in all tests allergenic material was collected by the vacuum cleaners. For the upright this was max = 54.02, min = 5.429, median = 21.72; and for the canister max = 39.86, min = 2.358, median = 10.08 micrograms of Der p 1. We conclude that the depth-distribution of Der p 1 allergen varies between different carpets which had been subjected to several years of normal use. Cleaning with both upright and canister style vacuum cleaners has variable, but generally negligible effects on the concentration and distribution of Der p 1 allergen in used carpets.

306 Effect of Disodium Octaborate Tetrahydrate on House Dust Mites in Carpeting

Jeffrey D Miller Allergy & Asthma Associates, Danbury, CT

Carpeting is a substrate for house dust mite growth and a source of dust mite allergen. Current NHLBI guidelines no longer recommend the use of acaricides on carpets, and several products have been shown to have only minimal efficacy in homes. Although not all insecticides are miticides, insecticides that are able to kill fleas often kill mites as well. A product originally used to kill fleas in carpets, Disodium Octaborate Tetrahydrate $Na_2B_8O_{13}$-$4H_2O$ is now being marketed (Mitex™) for killing mites in carpets. Studies were done on its effect on live mites in carpeting. Sections of low-pile carpeting and foam rubber carpet padding were inoculated with dense cultures of *D. pteronyssinus*, and placed in storage boxes at room temperature, with 75% humidity maintained by equilibration with saturated NaCl solution. Following the manufacturer's directions, ½ cup of Mitex™ was dissolved in 32 oz of water, to treat 50 ft^2 of carpet. Each square foot of carpeting was sprayed with 8 sprays from a hand sprayer, an amount determined to deliver .64oz of solution. Control sections were untreated. The number of live mites per cm^2 of each of ten sections of carpeting, and in the padding beneath the carpeting, was determined by the heat escape method at 3, 6, 9 and 13 weeks. Treatment significantly decreased, but did not totally eliminate, live mites in the carpet. Results were equivalent when the study was repeated using twice the recommended amount of the product. Treatment had a less pronounced effect on the number of live mites in the padding beneath the carpet. This limitation has been observed with other products, and may be a limiting factor in the in-home effectiveness of any acaricide, but could conceivably be lessened by application with a deep cleaning carpet-cleaning machine. Disodium Octaborate Tetrahydrate (Mitex™) decreased but did not totally eliminate *D. pteronyssinus* mites in carpeting.

Live Mites per cm^2

	CARPET				CARPET PADDING			
	MITEX	CONTROL	%	p	MITEX	CONTROL	%	p
3 weeks	9.8	455.1	2.2%	.01	55	158.7	34.7%	.04
6 weeks	75.2	351.1	21.4%	.01	11.9	57.4	20.7%	.01
9 weeks	9.7	85.2	11.4%	.01	4.5	6.7	67.2%	NS .21
13 weeks	5.5	23.7	23.3%	.01	1.8	1.0	180%	NS .09