tives on frequency. There were 5 questions on sprays (window, oven, furniture, hair and other sprays), 3 on office equipment (copy machines, laser and ink jet printers), 4 on combustion sources (candles, incense, wood, kerosene) and one on environmental tobacco smoke (ETS). Burning of incense, wood or kerosene was combined to a combustion source index (CSI). Use of office equipment was combined to an office machine index (OMI). Cleaning sprays were combined to a cleaning spray index. Exhaled NO was measured [NIOX MINO (50 ml/min)]. FeNO was log-transformed and associations were analysed by multiple linear regression, adjusting for age, sex, pollen/furry pet allergy and smoking.

Results: Median FeNO was 17 ppb (IQR 11-22). 14% were above 25 ppb. FeNO was positively associated with cleaning spray index (p=0.047), and use of window spray (p=0.02). No associations were found for FeNO and hair spray, other sprays, ETS, candles, CSI or OMI.

Conclusion: Domestic cleaning sprays, especially window spray, can be a risk factor for airway inflammation, measured as FeNO. This is in agreement with a previous study showing associations between incidence of asthma and domestic cleaning sprays (Zock et al., Am J Respir Crit Care Med, 2007;176:735-741).

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Endotoxin levels in primary schools and homes of Dutch school children José Jacobs, Esmeralda Krop, Dick Heederik. Environmental Epidemiology, Institute of Risk Assessment Sciences, Utrecht, Netherlands

Background: Indoor air quality is essential for children's health. Several studies describe the variety and extent of indoor pollutant exposure in homes and to a lesser extent in schools. However studies that include both environments in one study are sparse.

Objective: To assess indoor endotoxin levels in dust and compare levels in primary schools and homes of children.

Methods: This study is an extension of the European HITEA project. Ten schools with moisture/dampness problems (index) and reference schools were selected, based on building questionnaires and on-site inspections. Airborne dust at several locations in school was passively sampled with Electrostatic Dust fall Collectors (EDC), during 8 weeks in March/April 2010. In the same period, dust was sampled during 2 weeks in 169 children bedrooms from index and reference schools.

Results: Average endotoxin levels ranged from 4355 to 12101 EU/m² in schools, and from 923 to 2570 EU/m² in homes, adjusted to a two week sampling period. Both school and home endotoxin levels tended to be higher in the index than in the reference category (average ratio~1.35). However, within the index category, and also within the reference, variation between schools was higher than between both categories. There was less variation between home endotoxin levels within and between both index and reference categories. Class room occupancy was related to endotoxin levels. Home characteristics associated with endotoxin levels were the number of people living in the house and building age.

Conclusion: Average endotoxin levels were considerably higher in schools than in homes. Occupancy was significantly related with school and home endotoxin levels. Home age also affects endotoxin levels.

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The household dust bio-environment and lung function in adult asthma Paul D. Blanc¹, Stephen Van Dyken¹, Steve Vesper², Patricia Quinlan¹, Laura Trupin¹, Carlos Iribarren³, Patricia P. Katz¹, Edward H. Yelin¹, Miriam Cisternas⁴, John R. Balmes¹. ¹Medicine, University of California, San Francisco, CA, United States; ²Division of Exposure Research, U.S.

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Background: The household bio-environment includes molds, bacteria, and animal antigens that may affect lung function, especially in asthma.

Methods: Dust from adult asthmatics' homes was quantified for: Environmental Relative Moldiness Index (ERMI, a DNA-based assay reflecting indoor mold); chitin (found in mold cell walls and invertebrate exoskeletons, assayed by blot densitometry); endotoxin (LPS; limulus assay); beta-1,3-glucans (BG), dust mite (DM), and cockraach (CKR) (ELISAs). We analyzed Spearman correlations among the exposures. Linear regression tested ERMI, chitin, LPS, and BG as predictors of FEV₁, with stratification by greater than/less than a detectable level (>DL) of both DM and CKR.

Results: Data from 72 dwellings were available for all variables. Chitin was significantly correlated with BG (r=0.29; p=0.01) and DM (r=0.33; p<0.01) and weakly (negatively) with both ERMI (-.20; p=.09) and LPS (-.20; p=.09). BG correlated with DM and CKR (r=0.39 and -.28, respectively; p \leq 0.01); ERMI correlated negatively with CKR (r=-31; p<0.01). Adjusting for LPS and BG concentrations, chitin was significantly associated with *better* FEV₁% predicted (+4.6% per ng chitin/microgram dust; p<0.001), while ERMI was not (p>0.3). Among 37 subjects with DM or CKR >DL, results were similar, but among 35 subjects <DL for DM/CKR, FEV₁% predicted was positively related to both chitin (+7.3%; p<0.01) and ERMI (+2.1% per unit; p<0.01).

Discussion: Chitin and ERMI levels may be associated with better FEV₁; the ERMI effect may depend on absent DM/CKR co-exposure.

Clinical: In adult asthma, DM and CKR control interventions should consider other potential co-exposures in the complex home bio-environment. NIH/NIEHS R01 ES 10906.

219. Indoor hazards and respiratory disease: irritants and allergens

1723

Domestic use of hypochlorite bleach and respiratory infections in children Jan-Paul Zock¹, Lídia Casas¹, Alícia Borràs-Santos¹, José Jacobs², Esmeralda Krop², Dick Heederik², Anne Hyvärinen³, Martin Täubel³. ¹Centre for Research in Environmental Epidemiology (CREAL), Hospital del Mar Research Institute (IMIM), Barcelona, Spain; ²Dept. of Environmental Epidemiology, IRAS, Utrecht, Netherlands; ³Dept. of Environmental Health, National Institute for Health and Welfare (THL), Kuopio, Finland

Hypochlorite bleach is commonly used in private homes for cleaning and disinfection. Professional bleach use has been associated with respiratory symptoms in adults, and a small study from Belgium suggested that domestic bleach use may increase the risk of recurrent respiratory infections in children (Nickmilder, M., et al. Pediatr Allergy Immunol 2007; 18:27-35). We studied the relationship between domestic bleach use and respiratory infections in a large international study of school children. Parent-administered questionnaires were obtained from 9425 children aged 6-12 years from 54 primary schools in Finland, The Netherlands and Spain. Information was obtained on the use of bleach for home cleaning and respiratory health including 8 types of infections in the previous 12 months. The use of bleach at least once a week was more common in Spain (72%) and The Netherlands (57%) than in Finland (7%). In multivariable logistic regression models with adjustment for sex, age, educational level, passive smoking, presence of mould in the home and country, the risk of several respiratory infections was higher in children who lived in a home where bleach was used. This association was particularly apparent for influenza (Odds Ratio 1.21; 95% Confidence Interval 1.06-1.37), tonsillitis (1.20; 1.03-1.39) and bronchitis (1.16; 0.95-1.42). The risk of any recurrent infections apart from common colds in the previous year (overall 53%) was 14% higher in children from homes where bleach was used, being consistent for the 3 countries (p for heterogeneity 0.57). In conclusion, this large cross-sectional study confirms that the use of bleach in the home may increase the risk of respiratory infections in children.

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FeNO in adults in relation to cleaning sprays and other particle generating activities in homes in Scania, Sweden

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Aim: To study associations between FeNO and use of sprays and other particle sources at home.

Methods: Totally 106 adults answered a questionnaire on particle sources at home in a larger population survey in Scania, Sweden. Each question had four alterna1727

Cat, dog and horse allergens in day care centres in Uppsala, Sweden, associations with FeNO and dyspnea

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Aim: To study associations between FeNO, FEV1 and dyspnoea in day care centre staff and levels of cat, dog and horse allergens in day care centres.

Methods: 62 staff in 5 day care centres in Uppsala participated in a study performed 3 times in each subject in spring, in connection with a diet study. Dust was collected by vacuum cleaning and analysed for cat (Fel d1), dog (Can f1) and horse (Equ cx) allergens by ELISA. Amount of allergens per ALK-filter was calculated by multiplying concentration with amount of fine dust. Airborne allergens were sampled in Petri dishes for 1 week. Exhaled NO was measured by NIOX MINO and FEV1 by dynamic spirometry. Dyspnoea was rated from 0-100%. FeNO and dyspnoea were log-transformed and associations analysed by multiple linear regression, adjusting for age, atopy, smoking, and body mass index (BMI). All were females.

Results: There were no pets in any building, but all allergens were common. Geometric mean (GM) (ng/g) were 1199 Fel d1, 666 Can f1 and 478 Equ cx. Fel d1 was found in 100% (GM=29.8 ng/m² and day), Can f1 in 33% and Ecu c x in 13% of Petri dish samples. FeNO was higher at higher amount of Fel d1 (p=0.04) and Can f1 (p=0.04) and lower at higher amount of Equ cx (p=0.01). No associations were found for FEV1 or dyspncea and allergen levels.

Conclusion: Cat, dog and horse allergens were common in the day care centres, due to track in by clothes or hair. Cat and dog allergens in day care centres can be a risk factor for airway inflammation, measured as FeNO. The negative association for horse allergen remain unclear. It could be due to co-variance with some protective indoor factor, or a healthy life style related to horse riding.

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High indoor microbial levels are associated with reduced Th1-cytokine secretion capacity in infancy

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Background: In the early stages of life exposure to microbes and their components may affect the maturation and functions of immune system.

Objective: To examine whether the house dust microbial content is associated with cytokine -producing capacity at birth and at age 1 year.

Methods: Production of TNF- α , IFN- γ , IL-5, IL-8 and IL-10 at birth (n=228) and at age 1 year (n=200) following 24h and 48h whole blood stimulation with Staphylococcal enterotoxin B (SEB), lipopolysaccharide and phorbol ester/ionomycin were measured using ELISA. Ergosterol (marker for fungal biomass), muramic acid (marker for Gram-positive bacteria) and 3-hydroxy fatty acids (C10:0-C14:0, marker for Gram-negative bacteria) were analyzed from floor dust. Five single microbial species or groups were determined using quantitative polymerase chain reaction method.

Results: A high total level of Gram-positive bacteria in general or Mycobacterium spp. in house dust was associated with decreased SEB-stimulated IFN- γ production, especially at age 1 year. Total level of analyzed indoor fungi (PenAsp group, Trichoderma viride group, Wallemia sebi) was also inversely associated with IFN- γ production at age 1 year, but this association lost significance after multivariate adjustment. Only few associations were found between microbial exposures and other measured cytokines.

Conclusions: High indoor microbial exposures may affect immune development in early life by reducing Th1 –cytokine secretion capacity. In the future, more attention should be paid especially to the immunomodulatory role of Gram-positive bacterial exposures.