

Oral Session 7

Chemicals and Occupational Allergy

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Atopy and total IgE levels may predict development of occupational allergy

Krop, E¹; Heederik, D¹; Lutter, R²; De Meer, G³; Aalberse, R⁴; Jansen, H²; Van der Zee, J⁵
¹Utrecht University, Institute for Risk Assessment Sciences, Utrecht, the Netherlands; ²Academic Medical Center of the University of Amsterdam, Department of Pulmonology/Experimental Immunology, Amsterdam, the Netherlands; ³Municipal Health Service, Fryslân, Leeuwarden, the Netherlands; ⁴Sanquin Blood Supply Foundation, Department of Immunochemistry, Amsterdam, the Netherlands; ⁵Academic Medical Center of the University of Amsterdam, Department of Pulmonology, Amsterdam, the Netherlands

Background: Sensitization to occupational allergens is frequently found in laboratory animal workers. It can cause serious health problems like asthma. It is known that atopy is a major risk factor for occupational sensitization. However, it is considered insufficient to advice against working with animals as approximately 50% of the atopic animal workers will not develop an occupational allergy. We investigated whether serology, health questionnaire outcomes, and long function parameters are associated with the development of occupational sensitization. Using these results, we tried to develop a model to predict the development of occupational sensitization.

Methods: In a prospective cohort study, 110 starting laboratory animal workers were followed for 2 years. All animal workers worked with rats and/or mice. At inclusion, workers completed questionnaires on exposure to laboratory animals, (respiratory) health and family history of atopy. In addition, they were invited for blood withdrawal, skin prick tests, lung function and methacholine airway responsiveness. Total IgE and levels of allergen-specific IgE antibodies were measured in the serum samples. Data of a previous observational cohort of 160 laboratory animal workers were used for validation of the results found in the present study.

Results: Twenty-two (20%) new cases of allergic sensitization to rats and/or mice were identified during follow-up. Atopic status, the number of parents reported to have allergic disease, total IgE level, a decreased bronchial methacholine threshold, working with rats and estimated level of exposure to rats were associated with an increased risk

of becoming sensitized. In multivariate logistic regression analysis, a model including atopy and total IgE predicted sensitization best. This finding was corroborated in the separate validation cohort. Based on these results, preemployment counseling aimed at applicant laboratory animal workers with atopy and a total IgE > 100 IU/ml may be able to reduce occupational sensitization by up to 45–50% with < 10% false-positive predictions.

Conclusion: The combination of atopy and total IgE offered the best model to predict development of occupational sensitization to laboratory animal allergens.

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Sodium hypochloride induces bronchial hyperresponsiveness in a granulocyte-independent way

Hox, V¹; Vanoirbeek, J²; Callebaut, I¹; Bobic, S¹; De Vooght, V²; Vermeer, A¹; De Swert, K¹; Ceuppens, J¹; Nemery, B²; Hellings, P¹

¹University Hospitals of Leuven, Department of Experimental Immunology, Leuven, Belgium; ²University Hospitals of Leuven, Research Unit of Lungtoxicology, Leuven, Belgium

Background: Repeated visits to chlorinated swimming pools are associated with increased risk of airway inflammation, respiratory allergies and asthma. Sodium hypochlorite (NaClO), a powerful anti-oxidant that is used for chlorination of pools, has been suggested as the etiologic factor, without knowledge of immunologic mechanisms by which NaClO may cause or interfere with airway allergy.

Aim: To investigate the effect of NaClO on airway hyperreactivity and inflammation in a mouse model of experimental allergic asthma, previously used in our facility.

Methods: In a first series of experiments, naive male BALB/c mice received seven nasal instillations of OVA on alternate days with/without NaClO (0.0003% active chlorine in water). Control groups were instilled with saline or NaClO alone. In a second series, mice were sensitized to OVA by eight i.p. injections on alternate days, followed by exposure to nebulized OVA on seven consecutive days, with/without concomitant nasal instillation of NaClO. In

both series of experiments, bronchial hyperreactivity (BHR) and pulmonary reactivity to metacholine was measured using the Flexivent[®] system, 48 h after the last intranasal instillation. Results were calculated as the area under the curve (AUC) of the pulmonary resistance measurements. Differential cell counts were performed on cytospin preparations of broncho-alveolar lavage (BAL) fluid.

Results: We found significantly increased BHR in naive mice treated with OVA/NaClO nasal instillations whereas no BHR was seen in control mice receiving OVA alone (AUC = 10.8) or NaClO alone (AUC = 9.7) (both $P < 0.05$). In sensitized mice with experimental allergic asthma, BHR was higher in those mice where NaClO was endonasally instilled (AUC = 32.36) compared to the controls (AUC = 25.64). This difference did not reach significance. In both series of experiments, the increase in BHR seen in the OVA/NaClO group was not associated with any overt influx of eosinophils or neutrophils.

Conclusion: Exposure of the upper airways to low concentrations of NaClO increases the BHR via pathways that are independent of the bronchial influx of granulocytes.

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A study about the allergic status and toxicological survey of welding workers exposed to metal fume containing nanoparticles

Chiung, Y¹; Liu, P²; Tsai, M³; Hsieh, C⁴; Lin, J¹; Lee, S⁴; Chuang, Y⁵; Shih, T⁴

¹Institute of Occupational Safety and Health, Division of Medicine, Taipei County, Taiwan; ²Soochow University, Department of Microbiology, Shihlin, Taipei, Taiwan;

³National Taiwan University, Institute of Biotechnology, Taipei, Taiwan; ⁴Institute of Occupational Safety and Health, Division of Analysis, Taipei County, Taiwan;

⁵National Taiwan University, Institute of Biomedical Electronic and Bioinformatic, Taipei, Taiwan

Welding fume contains various hazardous heavy metals, and their nano-sized characteristics are noticed recently. Among them, chromium (VI) and dissoluble nickel are considered to possess lymphotoxicity and excuse for human carcinogen, manganese for Parkinson's disease. In our study, real-time PCR and ELISA assays were used to evaluate proteins or gene expressions related