BRONCHIOLITIS OBLITERANS SYNDROME IN POPCORN PLANT WORKERS

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RATIONALE: An eight-case cluster of severe fixed airway obstruction (four on lung transplant lists) among former workers of a microwave popcorn plant suggested an outbreak of unrecognized occupational lung disease.
METHODS: We reviewed medical records of sentinel cases, conducted interviews, and performed serial spirometry testing.
RESULTS: Cases worked in microwave popcorn production, rather than in kernel popcorn packaging or warehouse areas. Exposures included soybean oil, salt, and butter flavorings for four male oil mixers and four female microwave packagers of flavorings and kernel popcorn. Ages ranged from 29-53 years (median age 43.3), and three had never smoked. Cases had onset of cough, shortness of breath and wheezing between 1992-2000, after 5 months -6 years employment. FEV1 % predicted ranged from 14-68%; FEV1/FVC % predicted from 22.6-75%, and all had high residual volume. Six of eight workers had normal single breath carbon monoxide diffusing capacity. Chest x-rays showed hyperinflation in three cases. Two cases had pathology consistent with obliterative bronchiolitis, one of whom had granulomas.
CONCLUSION: This worker cluster of fixed airway obstruction is best explained by endemic bronchiolitis obliterans syndrome likely caused by a previously unsuspected inhalation hazard from occupational exposure.

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EXPOSURE TO OZONE AND OTHER IRRITANT GASSES IN PULP MILLS AND THE ONSET OF RHINITIS

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Rationale: To examine the effect of exposure to gassings of ozone, chlorine dioxide, or sulphur dioxide on rhinitis onset among pulp mill workers.
Methods: Workers from two sulphate pulp mills (n=104) and two control paper mills, which had no gassing events (n=68), were included in the study. Rhinitis was self-reported and defined as ever having, since age 15, nasal problems such as nasal obstruction or sneezing apart from a cold. Gassings were self-reported as exposure to the gases resulting in coughing, wheezing, breathlessness, or pain in the thorax. Proportional hazard regression was used to model rhinitis onset while controlling for potential confounders.
Results: The incidence of rhinitis was greater for sulphate pulp mill workers exposed to ozone gassings versus paper mill workers (44 cases/10^3 person-years versus 21 cases/10^3, respectively), and the corresponding hazard ratio (HR) from regression analysis was 3.4, 95% CI 1.3, 8.7. The sulphate workers not exposed to an ozone gassing were not found to be at an increased risk (HR 0.9, 95% CI 0.3, 2.4). Also, a report of gassing with any of the three irritant gases (including ozone) was not related to rhinitis onset (HR 1.2, 95% CI 0.5, 3.1).
Conclusions: Sulphate pulp mill workers exposed to ozone gassings are at increased risk of rhinitis.

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A DESCRIPTIVE STUDY OF WORK-AGGRAVATED ASTHMA

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Rationale: Work-related asthma (WRA) is currently the most common lung disease seen in occupational health clinics in the United States. A better understanding of work-aggravated asthma (WAA), as well as work-related new-onset asthma (NOA), is needed to aid in prevention efforts. **Methods:** This study compares WAA and NOA in the United States using cases reported from four states to the Sentinel Event Notification System for Occupational Risks (SENSOR) surveillance program between 1993 and 1995. Differences and similarities were noted in demographic features, primary industry, primary occupation, and exposure. **Results:** 210 cases of WAA and 891cases of NOA were reported between 1993 and 1995. WAA cases were significantly more likely to be younger (38y vs. 42y), female (69% vs. 53%), non-white (33% vs. 22%), employed in the service industry (40% vs. 29%), and working in technical, sales, and administrative support occupations (34% vs. 18%) compared to NOA cases. WAA cases also reported mineral and inorganic dusts (21% vs. 10%) as the most common exposure agent, as opposed to NOA cases. **Conclusion:** WAA cases differ from NOA cases with respect to demographic characteristics, industry, occupation, and agents. An understanding of these differences is critical in planning and implementing preventative interventions.

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WORK-RELATED REACTIVE AIRWAYS DYSFUNCTION SYNDROME IN SELECTED U.S. STATES

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Rationale: To elaborate the descriptive epidemiology of work-related cases of reactive airways dysfunction syndrome (RADS).
Methods: Cases of work-related asthma (WRA) were identified in four states in the United States during 1993-1995 as part of the Sentinel Event Notification Systems for Occupational Risks (SENSOR). Information gathered by follow-back interview was used to compare 123 work-related RADS cases to 301 other WRA cases whose onset of disease was associated with a known inducer.
Results: RADS represented 14% of all new-onset WRA cases identified by the state SENSOR surveillance systems. The adverse impact of their condition was apparent by what the RADS cases reported during the follow-back interview. In particular, 89% still had breathing problems, 79% had ever sought emergency care and 39% had ever been hospitalized for work-related breathing problems, 54% had applied for worker compensation benefits, and 41% had left the company where they experienced onset of asthma. These values equaled or exceeded the comparable figures for those WRA cases whose onset of asthma was associated with a known inducer.
Conclusions: Work-related RADS represents a minority of WRA cases, but the adverse impact of this condition appears to equal that of other new-onset WRA cases.

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TOLL-LIKE RECEPTOR 4 AND TNF GENE POLYMORPHISMS IN FARMERS WITH AIRWAY DISEASE.

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Farmers commonly develop airway disease symptoms and respiratory tract inflammation after exposure to organic dusts, which are rich in LPS. TNFα is one of several mediators of inflammation released in the airway after organic dust exposure. It was proposed that polymorphisms in the toll-like receptor 4 (TLR4) gene, which are associated with LPS hyporesponsiveness, and/or polymorphisms of the TNFα gene that result in increased TNFα production might be associated with airway disease in farmers. This cross-sectional study consisted of collecting respiratory questionnaire information and blood specimens from 176 farmers at a farm trade show. Genotypes were determined by PCR amplification and restriction enzyme digestion. It was determined that the TLR4 polymorphisms TLR4 Asp299Gly and TLR4 Thr399Ile (n = 10 farmers, 6%) were associated with physician-diagnosed asthma (p = .039 and p =.026). These TLR4 polymorphisms were not associated with upper respiratory tract symptoms. There was no association between the TNFα polymorphisms TNF-238, TNF-308 and TNF+250 and asthma. However, there was an association between the TNF-308 polymorphism and reporting sneezing and nasal stuffiness after handling grain (n=36, 20%, p = .003). In summary, the presence of the toll-like receptor 4 polymorphisms was associated with asthma. It is possible that LPS hyporesponsiveness in farmers, who have heavy LPS exposure, could contribute to the presence of asthma. Production of increased amounts of TNFα could contribute to the presence of their nasal symptoms.

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NON-RESPONDERS AND RESPONDERS TO ENDOTOXIN SHOW DIFFERENT NON-PULMONARY EFFECTS

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Responsiveness of individuals to baseline, low and high endotoxin levels was analyzed based on recent information that genetic pleomorphism may result in varying responsiveness to endotoxin. Twenty male subjects (age 23.9±4.6 yrs) were analyzed based on baseline endotoxin exposure (normal lab setting), low endotoxin exposure (5 hour exposure in a canola oil treated swine barn room) and high endotoxin exposure (5 hour exposure in an untreated swine barn room). Subjects were divided based on being a "Responder" to high endotoxin if reduction in FEV_1 was greater than 10% (9 subjects, 12.9% reduction; median 3565.0 EU/m^3), and a "Non-responder" if reduction in FEV_1 was less than 10% (11 subjects, 6.3% reduction; $p< 0.001$; 2996.0 EU/m^3). At "low" level exposure Responder reduction in FEV_1 (3.7%; endotoxin 477.1EU/m^3) and Non-responder reduction in FEV_1 (1.3%; 359.3 EU/m^3) were also significantly different ($p=0.025$). Low level exposure showed PC_{20} values (Responders 201.9mg/ml and Non-responders 322.3 mg/ml) were not significantly different but serum WBC (7.1 c/ul vs 5.4 c/ul; $p=0.04$), eosinophils (0.20 c/ul vs 0.10 c/ul; $p=0.023$), and lympocytes (2.5c/ul vs 1.8 c/ul; $p=0.043$) were all significantly greater in Reponders vs Non-responders. Nasal lavage cell counts were significantly greater in Responders than in Non-responders (45,571 c/ul vs 13,665; $p=0.018$) at high endotoxin exposure. Repeated measures evaluation showed significantly greater trend for lower value for PC_{20}, and higher values for WBC, nasal IL6, nasal IL8 and total nasal lavage cells in Responders vs Non-responders. These findings suggest that Responders and Non-responders to endotoxin as defined at high level exposures exhibit different systemic characteristics that are present at both low and high endotoxin exposures. These characteristics could represent a fundamental difference in the manner in which Responders and Non-responders react to exposure environments.

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ABSTRACTS

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