Respirable Silica Exposure in U.S. Metal and Non-Metal Miners, 1998-2002

C.S. Rose[1], J.L. Weeks[2]. [1]NJMRC and UCHSC, Denver, CO; [2]Advanced Technologies & Laboratories International, Germantown, MD.

Rationale: The Mine Safety and Health Administration (MSHA) obtains approximately 3,000 yearly air samples at surface and underground metal/non-metal US mines and mills to determine compliance with its permissible exposure limit for respirable silica. We hypothesized that analysis of recent MSHA data would show decreasing silica exposure to miners over time. **Methods:** We obtained MSHA sampling results for the 5 year period from 1998-2002, assessed concentrations of respirable quartz, and analyzed to identify jobs with risk for silicosis and lung cancer. We defined three risk factors: (1) average exposure above 50 mg/m^3; (2) more than 10% of samples exceeding 150 mg/m^3; and (3) potential exposure to freshly fractured quartz. We analyzed for exposure trends over the 5-year period, and compared findings to previous analyses to assess historical trends in silica exposure. **Results:** All three risk factors were present for stonecutters and ball mill operators. Two risk factors were present for rotary drill operators and crusher operators. One risk factor (mean exposure above 50 mg/m^3) was evident for cleanup workers, bagging operators, laboratory technicians, laborers, truck loaders, mechanics, and kiln operators. We found no change in geometric mean concentrations of silica exposure for any job over the five-year time period. Compared to earlier reports, we found reductions in exposure for baggers, laborers and drill operators, but increased exposure for crushers, ball mill operators and dryers. **Conclusions:** Stonecutters and ball mill operators in metal/non-metal mines continue to face risks for silica-induced occupational lung diseases. Exposure to respirable silica is evident in other mining job tasks, with few downward trends in exposure over time. Greater efforts are needed to reduce exposure to respirable silica in the metal and non-metal mining industry to prevent occupational lung diseases.

This Abstract is Funded by: None

Practice Patterns and Educational Assessment of Ontario Respirologists (RPs) for Occupational Lung Disease (OLD)

S. Tabassum[1,2], S. Tarlo[1,2], G. Liss[1,2], F. Silverman[1,2,3], D.L. Holness[1,2]. [1]Gage Occupational & Environmental Health Unit, Canada; [2]St Michael's Hospital, Canada; [3]University of Toronto, Toronto, ON, Canada. Email: shehrina.tabassum@utoronto.ca

Introduction: To improve health service delivery for the diagnosis & management of OLD we need to understand current practice patterns, barriers to service delivery & educational needs. **Methods:** A survey to probe practice patterns & educational needs was sent to all registered Ontario RPs (49% responded). **Results:** Only 8% reported seeing more than 20 patients/yr with occupational asthma/work aggravated asthma (OWAA). Over 67% state personal need for more education on occupational exposures & related health effects. About 50% cite readily available referral sources, history-taking templates, 1-800 numbers & websites as means for improving recognition & management of OWAA. **Summary:** The study provides information on current practice patterns that can be utilized to improve service delivery models for occupational disease & create continuing education sessions that address RPs' needs.

Table 1: Practice patterns related to OWAA

Practice patterns	% Reporting most/all of the time	Key reasons for not complying
Take work history	92%	time constraints, forget to ask, lack confidence
Advise patients on health risks of workplace agents	53%	patients unable to provide information, lack knowledge, time constraint
Diagnose patient myself	27%	lack expertise, lack necessary testing facilities, lack knowledge on worker compensation claim
Advise patients with suspect OWAA to stop work until diagnosis is complete	26%	
Advise patients to wear protective equipment	99%	

Table 2: Rating of RPs' knowledge & reported further education needs

Topics	% Reporting good/excellent	% Desiring education
Asbestos	75%	43%
Silicosis	57%	42%
Occ asthma	49%	82%
Work aggrv asthma	58%	68%
Industrial bronchitis	31%	71%
Adverse effects of occ exposure	29%	76%
Protective equipment	12%	85%
Prevention & control	15%	77%
Workers' compensation	3%	82%

This Abstract is Funded by: Ontario Workplace Safety and Insurance Board

Cell Markers and Cytokines in Cement Masons: Associations between Silica Dust Exposure, Inflammation and Immunity

C. Carlsten[1], A.J. De Roos[1], J. Kaufman[1], H. Checkoway[1], N. Seixas[1]. [1]University of Washington, Seattle, WA. Email: carlsten@u.washington.edu

Rationale: Silicosis and silica exposure are associated with increased incidence of autoimmune disease. Yet the mechanism remains obscure with reports of both increased and decreased immunoglobulin levels; chemokine and cell-surface marker analysis has been similarly inconclusive. We report on a cross-sectional study of immune markers in a cohort of masons with the aim of identifying early markers of silica-related pathology for validation in a prospective study. Methods: Demographics, dust exposure history, symptoms, spirometry, exhaled nitric oxide, and blood (for immunoglobulins, cytokines, cell counts and surface markers) were obtained from 15 cement masons and 24 electrician controls. Continuous variables were compared by student's t-test (electricians vs. masons) or by ANOVA (electricians vs. masons, subdivided by duration of employment). Results: Compared to controls, masons had higher dust-hr-years (40.4 vs 8.4, p=0.0002), as well as serum IL1-B (12.5 vs 9.2 pg/ml, p=0.005), IL4 (176.9 vs 62.8 pg/ml, p=0.01), IL10 (45.1 vs 20.9 pg/ml, p=0.0002), and IFN-gamma (142.4 vs 62.7, p=0.0003). By contrast, masons had a lower percentage of CD25-positive lymphocytes (12.4 vs 20.4, p=0.01). Results for dust-hr-years, IL10, and IFN-gamma retained significance following Bonferroni correction. Conclusions: The data suggest a proinflammatory state that may be simultaneously immune-dysregulated, with reduced regulatory (suppressor) T-cells, amongst early-career masons. A larger, prospective study, based on the feasibility and results of the present pilot, may deepen insight into the mechanisms of immune disease amongst the silica-exposed.

This Abstract is Funded by: Fred Hutchinson Cancer Research Center, UW Dept of Occupational and Environmental Health Sciences, NIOSH Education and Research Center - all in Seattle WA

Heme Oxygenase-1 Correlates with Oxidative DNA Damage in Silicotic Patients

T. Sato[1], M. Takeno[1], T. Kaneko[1], Y. Kirino[1], Y. Nagashima[1], Y. Yamauchi[2], Y. Saito[2], T. Sasaki[2], K. Honma[3], Y. Ishigatsubo[1]. [1]Yokohama City University Graduate School of Medicine, Yokohama, Japan; [2]Rosai Hospital for Silicosis, Tochigi, Japan; [3]Dokkyo University School of Medicine, Tochigi, Japan. Email: taka1220@yokohama-cu.ac.jp

Rationale: Heme oxygenase-1(HO)-1, a rate-limiting enzyme in heme catabolism, has anti-oxidative, anti-apoptotic, and anti-inflammtory actions, leading to protection against various respiratory diseases. However, the role of HO-1 remains uncertain in silicosis, which is a chronic fibrotic disorder in which a preferential Th1 response and oxidative injury are involved. To this end, we investigated 8-hydroxydeoxyguanosine (8-OHdG) as a marker of oxidative DNA damage, cytokines, and HO-1 in serum from patients with silicosis.

Methods: Forty-six male silicotic patients (56-83 yrs, mean age: 72yrs), who used to be either miners (n=22), stone masons (n=14), or tunnel workers (n=10), were enrolled in this study under informed consent. Patients who had the following conditions were excluded; the presence of active inflammation, poor general conditions, and renal dysfunction (Cr > 1.2 mg/dl). Serum levels of HO-1, 8-OHdG, tumor necrosis factor-alpha, interleukin (IL)-1 beta, IL-2, IL-4, IL-5, IL-6, IL-8, IL-10, IL-12, and interferon-gamma were determined by specific ELISA kits. Respiratory function was assessed by spirometry. The forced expiratory volume (FEV)1.0% predicted was calculated from age and height adjusted values.

Results: Silicotic patients exhibited increased serum levels of HO-1, which was correlated negatively with 8-OHdG (rs=0.31, p=0.032), and positively with IL-12p40 (rs=0.30, p=0.04), %FEV1.0 (rs=0.34, p=0.02), and peak expiratory flow rate (rs=0.43, p=0.003). Age and occupation history did not affect the results.

Conclusion: Our data suggest that serum HO-1 is useful as a biomarker of silicosis and that increased HO-1 suppresses oxidative tissue injury of the lung, leading to favorable outcomes of the pulmonary functions in this disease.

This Abstract is Funded by: None

Geographic Variability in Coal Workers' Pneumoconiosis Mortality in the U.S.

G.A. Pinheiro[1], V.C. Antao[1], J. Wood[1], M.D. Attfield[1]. [1]National Institute for Occupational Safety and Health, Morgantown, WV. Email: ghp6@cdc.gov

U.S. national mortality rates from coal workers' pneumoconiosis (CWP) have declined substantially over time, showing a major peak in 1972 and a secondary peak around 1982. However, state-specific temporal trends in mortality rates show very different patterns between Pennsylvania (PA) and the other states.

Objectives: To explore the nature and causes of the geographic differences in CWP mortality rates around the country.

Methods: Numbers of deaths and age-adjusted mortality rates from 1968 to 2000 were calculated for the main coal-mining states and regions for U.S. residents aged 15 and older and analyzed in relation to coal type (anthracite versus bituminous), employment, and production (surrogate for dust level).

Results: In PA, mortality from CWP peaked in 1972 and declined continuously from then on. In contrast, in all other states but Wyoming, CWP mortality rose from the early 1970s and peaked 10-20 years later (mean=1982). Numbers of deaths and mortality rates were about 300% and 400% higher in the PA anthracite counties versus the PA bituminous counties and other states. Temporal trends were associated with patterns of employment and production in the different regions.

Conclusions: The temporal trend in national CWP mortality reflects the combination of different trends in the anthracite and bituminous regions and is heavily influenced by mortality rates among anthracite miners in the period 1970-80. Geographic patterns of mortality reflect the influence of mining employment, toxicity (coal rank) and possibly mine dust concentrations. Although not investigated, diagnostic perceptions in different regions of the country may also have played a role.

This Abstract is Funded by: None

What Makes a Endobronchial Anthracotic Pigmentation?

E. Choi[1], D.M. LIM[1], J.W. Son[1], M.J. NA[1], W.Y. Lee[1]. [1]Department of Internal Medicine, College of Medicine, Konyang University, Daejon, Korea. Email: eugene@kyuh.co.kr

Objectives: Endobronchial anthracotic pigmentation, that shows a dark black or brown pigmentation mucosal changes of multiple bronchi combined with bronchial fibrosis and obstruction, is not rarely found during diagnostic bronchoscopy in korea. This study was performed to define the clinical characteristics and to determine the association with korean life style and other diseases such as coal workers pneumoconiosis or tuberculosis in patients with anthracotic pigmentation.

Methods: The retrospective analysis was done in 70(5.2%) patients with endobronchial anthracotic pigmentation, among a total of 1340 patients who underwent bronchoscopy. The distinctive clinical features, personal life style, past history, histology, microbiology, radiologic finding and natures of bronchoscopic lesion were analyzed.

Results: Mean age of the patients with anthracotic pigmentation was 59±9.21year old and male to female ratio was 1:5.9. The common respiratory symptoms of these were coughing and sputum(81%, 57/70), followed by dyspnea, hemoptysis in order. There was not related with smoking and occupational history such as coal worker and so on. Luminal narrowing or atelectasis was most common finding on CT(91%, 64/70). On bronchoscopy, the right middle lobe bronchus was most commonly involved (60%, 42/70), but multiple site involvement was dominant(87%, 61/70). The most common associated disease was tuberculosis, 40 cases(57.1%) diagnosed by AFB stain, TB PCR, bronchoscopic guided tissue biopsy and past history of tuberculosis. Other disease related with anthracotic pigmentation were that hypertension(21%, 15/70), diabetes(13%, 9/70), COPD(10%, 7/70), pneumoconiosis(1.4%, 1/70), asthma(0%, 0/70).

Conclusion: These results suggest that endobronchial anthracotic pigmentation was mostly related with pulmonary tuberculosis rather than coal related disease. And endobronchial anthracotic pigmentation was more prevalent in female of old age in korea.

This Abstract is Funded by: None

AMERICAN THORACIC SOCIETY | 100th ANNIVERSARY

VOLUME 2
ABSTRACTS ISSUE
2005

www.thoracic.org

Proceedings of the American Thoracic Society

1905 2005

ABSTRACTS

ATS 2005 International Conference

May 20–25, San Diego, California

AN OFFICIAL PUBLICATION OF THE AMERICAN THORACIC SOCIETY