Roofers: At Risk for Silicosis – Arizona, 2005

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AIHce Silica Roundtable
New Respirable Silica Source

- Phoenix Local of the Roofers Union requested Health Hazard Evaluations about adverse health effects from dust
- Dry cutting of cement roofing tiles generates respirable sized silica particles
• Personal breathing zone air sampling revealed respirable silica exposures exceeding both the OSHA Permissible Exposure Limit (PEL) and the NIOSH Recommended Exposure Limit (REL)

• First time respirable silica overexposure documented in the roofing industry!

S-shape cement roofing tile
Industries and tasks with previously known respirable silica exposures:

- Mines and quarries
- Demolition of concrete or masonry structures
- Highway construction
- Abrasive blasting – sandblasters, dental appliance manufacturers, etc.
- Dry sweeping or pressurized air blowing of concrete dust
- Polishing
- Soap and detergent manufacturing
- Ceramics and glass production
- Semiconductor and fiber optics manufacture
- Gypsum board production
- Foundries
Silicosis

- Lung disease caused by inhalation of respirable silica particles
- Incurable and irreversible
- Disease may progress even after exposure has stopped
- **Completely preventable!**

Photo by Val Vallyathan, Ph.D. NIOSH
2.2 million U.S. workers exposed to respirable silica
200 silicosis deaths reported every year
Mandatory reportable condition in some states
Underreported due to misdiagnosis
  - History of respirable silica exposure is required to diagnose silicosis
  - Lack of worker awareness of exposure
Study Design

• Cross-sectional study

• Goals
  – Determine extent of health effects among a group of exposed to respirable silica
  – Establish a baseline for OSHA mandated monitoring of worker pulmonary function and chest x-ray status over time
OSHA Special Emphasis Project

- OSHA Special Emphasis Project on Silica requires employees to have:
  - Medical examination
  - Pulmonary function testing
  - Chest x-ray

- The above tests are required:
  - pre-placement
  - at regular intervals during employment
  - termination
Methods: Study Inclusion Criterion

- Participants were current employees of 4 roofing contractors in union requested HHEs in Phoenix, AZ

HHE = Health Hazard Evaluation
Methods: Study Components

• Questionnaire
• Spirometry
• Chest X-ray
Methods: Questionnaire

- Demographic data
- Medical and smoking history
- Respiratory symptoms
- Occupational history
- Administered in participant’s primary language by NIOSH personnel fluent in English and Spanish
Methods: Spirometry

• All participants were coached in their primary language
• All spirometry data and computer generated results were reviewed by a NIOSH pulmonologist
Methods: Chest X-rays

- B-reader median read process
- A median profusion score of 1/0 or greater was considered abnormal

Diffuse round densities in a silicotic lung
Methods: Statistical Analysis

- SAS version 9
- Linear regression model
- Hankinson’s predicted values used for spirometry analysis*
  - FEV
  - FVC
  - FEV1/FVC

Results

• Worker Characteristics (n=120)
  – All male
  – Age range: 19-58 years with median age of 32 years
  – 110 (92%) Hispanic
• Employment duration: 0-27 years with a median of 7 years
• 66% current or past smokers
Respiratory Symptom Results

- 18 (16%) reported shortness of breath (SOB)
- 9 (8%) reported shortness of breath doing their usual job
- Only 3/18 (17%) of those that reported SOB had abnormal spirometry
Spirometry Results

• No unique “silicosis” spirometry pattern
• 15% abnormal
• When controlling for smoking, the following decreases were found:
  – 0.06% in % predicted FEV1 per year dry cutting (p=0.05)
  – 0.03% in % predicted FVC per year dry cutting (p=0.35)
Chest X-ray Results

- No chest x-rays positive for silicosis
- 19 (16%) required early notification for non-silicosis related findings

Normal Chest X-ray
Conclusions

• Air sampling documented new worker group exposed to respirable silica

• Adverse health effects found in this group
  – As duration of exposure increased, there was a statistically significant decrease in the % predicted FEV1 which could not be explained by smoking
Study Limitations & Challenges

- **Selection bias**
  - Sick workers no longer working
  - Mistrust of government agency decreased participation
- **Information Bias**
  - Language/translation issues
- **Transient nature of workforce**
- **No baseline employee medical data**
- **Participation rate could not be determined**
Recommendations for Work Practices in Respirable Silica Containing Environments

Employers should:
- Develop engineering controls to reduce or eliminate exposure
- Educate employees in their primary language
- Abide by current OSHA standards for medical screening
- Consistently enforce PPE compliance

Employees should:
- Always wear recommended PPE
- Be aware of signs and symptoms of silicosis
- Seek medical attention promptly for symptoms
- Inform physician of workplace silica exposure

Unions should:
- Encourage employees to participate in medical screening
- Assist in employee education of health hazards and PPE
Impact: Getting the word out....

- International Roofing Expo 2005 and 2006
  - Informational booth
  - Presentation to attendees
- Participated in multi-agency meeting
- Publications:
  - National roofers union newsletter
  - 3 trade journals
  - New NIOSH brochure
The National Institute for Occupational Safety and Health (NIOSH) works to assure safe and healthy conditions for workers through research, education and training in occupational safety and health.

Using Respirators

Until respirable silica exposures can be eliminated or reduced below current guidelines, a respirator program should be established. Steps for implementing a respirator program include:

- Regular air monitoring
- Training for workers using respirators
- Use of proper NIOSH approved respirators
- A medical examination of the worker’s ability to work while using a respirator
- Testing to make sure respirators fit
- Maintenance, inspection, cleaning, and storage of respirators

For more information about respirator programs, including what respirators have received NIOSH approval as a safe and effective, please visit the NIOSH website at: http://www.cdc.gov/niosh and click on the respirator link.

Working with Cement Roofing Tiles: a silica hazard

For more information about silica health effects and prevention methods contact us at:

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Cincinnati, OH 45226-1998

http://www.cdc.gov/niosh
1-800-35-NIOSH (1-800-356-4674)
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E-mail: publicaffairs@cdc.gov
NIOSH Silica Links and Publications

NIOSH Silica Topic Page:
http://www.cdc.gov/niosh/topics/silica/

Silica Roofer Brochure:

English:

Spanish:
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• Professional Health Services

Disclaimer: The findings and conclusions in this presentation have not been formally disseminated by NIOSH and should not be construed to represent any agency determination or policy.
Thank You

Silicosis: Conozca los datos!  
¿Trabaja usted en la construcción o hace limpieza abrasiva?  
¿Conoce usted a alguien que lo hace?

Silicosis: Learn the Facts!  
Do you work in construction or do abrasive blasting?  
Do you know someone who does?