Health Consequences of Overexposure to Respirable Coal and Silica Dust

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Presentation outline

- Lung diseases in coal mining
- Magnitude of impact on coal mining industry
- Regional “hotspot” findings
- Black lung video
Respirable dust in coal mining

• Dust less than 10 microns in size (cannot be seen with the eye)

• Overexposure can cause lung disease

• 1969 Federal Coal Mine Health and Safety Act first regulated miners’ exposures
  – established 2.0 mg/m³ respirable coal mine dust limit
  – required occupational dust sampling by MSHA and mine operators
  – established an X-ray surveillance program for underground coal miners
  – established a federal black lung benefits program

• Control technologies are implemented to reduce worker exposures
Diseases caused by inhalation of coal mine dust

• Fibrotic diseases – damage/destroy lung tissue
  – coal workers’ pneumoconiosis “CWP”
  – silicosis

• Airflow diseases “COPD” – block movement of air in and out of lungs
  – bronchitis
  – emphysema
  – mineral dust airway disease
Fibrotic lung diseases in miners

CWP and silicosis

• Similar patterns on chest x-ray
• Simple and Complicated forms of disease
• Complicated form known as Progressive Massive Fibrosis (PMF)
• International Labour Office (ILO) standards are used to determine severity of disease
• Cannot be cured, so prevention is the key
ILO classification of radiographs

ILO classification

| 0/- | 0/0 | 0/1 | 1/0 | 1/1 | 1/2 | 2/1 | 2/2 | 2/3 | 3/2 | 3/3 | 3/+ | A | B | C |

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simple CWP

PMF
Simple CWP or black lung

• Disease development typically takes over 10 years of dust exposure

• Worker may not initially have physical symptoms

• As disease progresses, symptoms do appear
  – coughing
  – wheezing
  – shortness of breath (especially during exercise)

• Greater chance to develop PMF
Coal Workers’ Pneumoconiosis

Basically Normal Lung

Coal Worker
Coal Workers’ Pneumoconiosis (CWP)
Black Lung Disease
Complicated CWP

- Progressive Massive Fibrosis (PMF)
- Fibrous tissue develops in lungs
- Lungs become stiff and cannot expand fully
- Breathing becomes difficult
- Lips and fingernails may have bluish tinge
- Fluid retention and signs of heart failure
Complicated CWP
(Progressive Massive Fibrosis)
Respirable crystalline silica (quartz)

- Silica is more toxic than coal (exposure limited to 1/20th that of coal in 1969 Act)
- Freshly fractured silica is more toxic than aged silica
- Smaller particles are more toxic
- Consequences of overexposure:
  - silicosis
  - airways diseases
  - pulmonary tuberculosis
  - chronic renal disease
  - lung cancer
Silicosis

• Chronic
  – occurs after 10 or more years of exposure
  – swelling in lungs
  – troubled breathing similar to COPD

• Accelerated
  – develops in 5 to 10 years
  – symptoms occur faster than in chronic silicosis

• Acute
  – develops in less than 5 years
  – lungs become inflamed and fill with fluid
  – severe shortness of breath and low blood oxygen
Silicosis

Simple

PMF
Acute silicosis at Gauley Bridge, WV

- Hydroelectric project near Gauley Bridge, WV (1930-1931)
- Drive a 3-mile tunnel to redirect the New River through the Gauley Mountain
- Sandstone and limestone strata containing high levels of silica
- 476 deaths resulting from acute silicosis
Treatment of CWP/silicosis in coal miners

• No medication can reverse dust damage

• Treatment directed at reducing symptoms and prevention of complications
  – vaccines against flu and pneumonia
  – antibiotics for infections and congestion
  – bronchodilators for airway spasm
  – oxygen supplementation
  – treatment for heart failure

• Lung/heart transplant is last resort
CWP prevalence by tenure among examined underground coal miners
Coal miner deaths with CWP as direct or contributing cause

(total deaths from 1968 – 2010 = 76,464)
Federal Black Lung Benefits Program
(total payments from SSA and DOL)

(total paid from 1970 – 2013 = $45.7 Billion)
Overexposures for high risk occupations
(MSHA Compliance Sampling Data from 2007 – 2011)
Enhanced Coal Workers’ Health Surveillance Program
(mobile examination unit travels to mining regions)

- health questionnaires
- work history
- spirometry testing
- chest x-rays
Percent of underground coal miners examined with CWP by MSHA district
(CY 2005 – 2009*)

* NIOSH CWHSP data query website at: http://webappa.cdc.gov/ords/cwhsp-database.html
Faces of Black Lung DVD

- DRDS interviewed two miners that have contracted CWP
- Miners discuss the importance of protecting themselves from dust exposure
- Copies available from Anita Wolfe (304) 285 - 6263

Faces of Black Lung Video
Important messages........

Carl Bailey
58 years old.
Worked 28 years in WV mines, with most of his work at the face

“And always remember: What’s on your face you can wash-off, but what’s on your lungs you can’t. So be safe, and take care of yourself.”

Chester Fike
55 years old.
Worked 34 years in mines in WV and MD and operated a continuous miner for 27 years.

“I was always trained to avoid injuries and I should’ve paid more attention to the dust.”
Thank you!

Questions??

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