New interest in an old enemy – rediscovering dust disease in mining

Dr David Meredith, September 2017

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Introduction

- The pneumoconioses
- How they develop
- How they are classified
- The symptoms of CWP and Silicosis
- CMDLD
- Industry insights

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Introduction

Black lung in Queensland existed when disease was thought to be eradicated: expert

By Nick Wiggins

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Long Term Diseases

- Reichman – U shaped curve of concern
  - Active interest
  - Complacency
  - Resurgence
- Did it ever go away?
  - May appear long after retiring
  - Can have symptoms similar to other diseases
  - May not recognise if exposure history not known
  - Not notifiable

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Pneumoconioses

- Pneumoconioses are a group of lung diseases caused by the fibrotic reaction to the deposition of certain dusts. The most important are:
  - Coal Workers Pneumoconiosis (CWP) – coal
  - Silicosis – crystalline silica
  - Asbestosis – asbestos fibres

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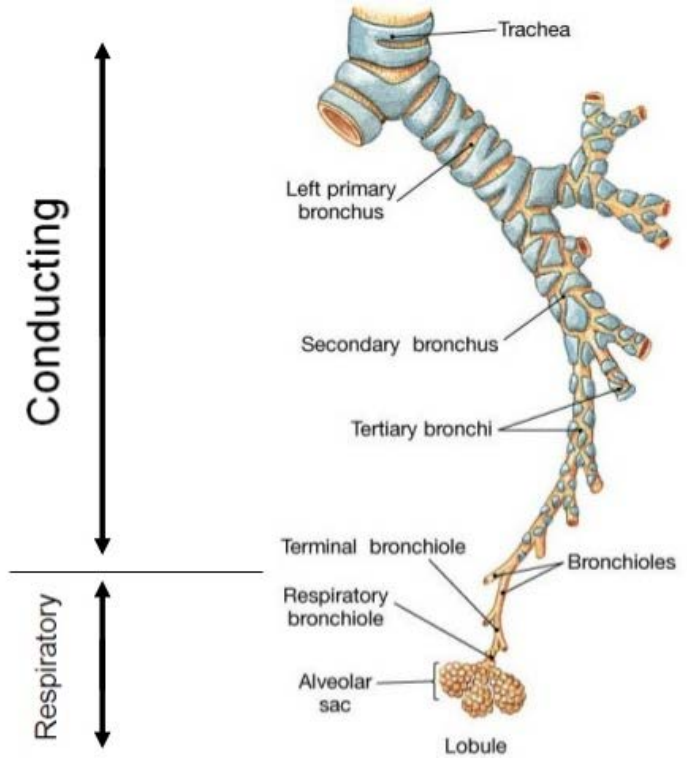
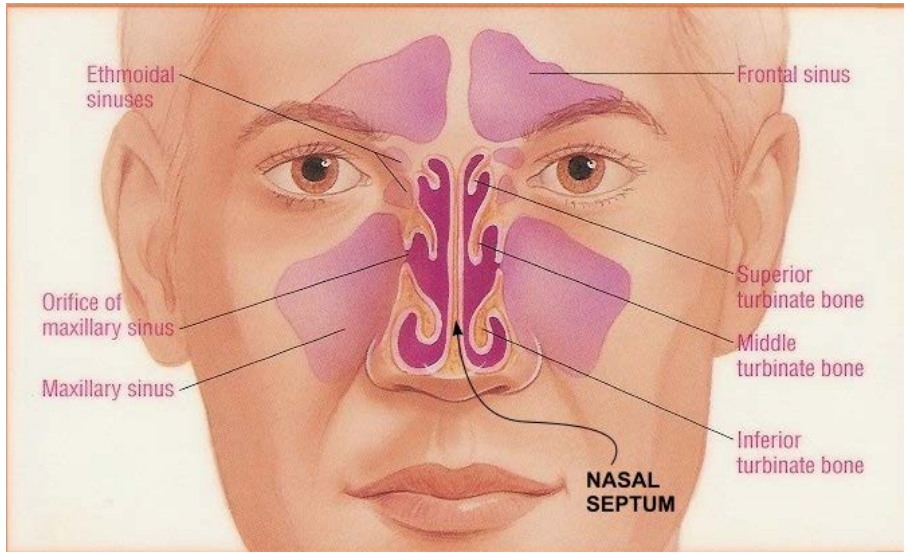
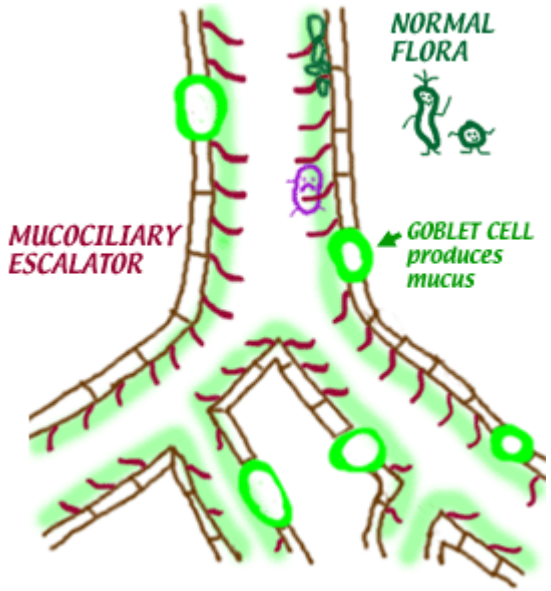
Lung Defences

- Nasal hairs
- Turbinates
- Branching airways
- Mucous membrane
- Mucociliary action







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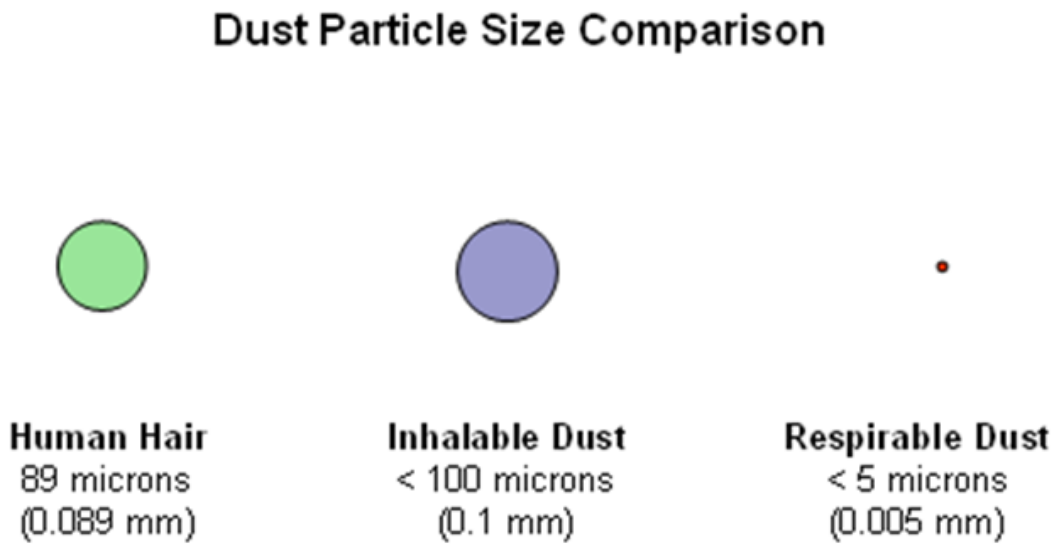
Lung Defences



- Particles < 100 microns are termed inhalable, but most are trapped and do not reach the terminal airways
- Particles < 5 microns are termed respirable and may reach the terminal airways

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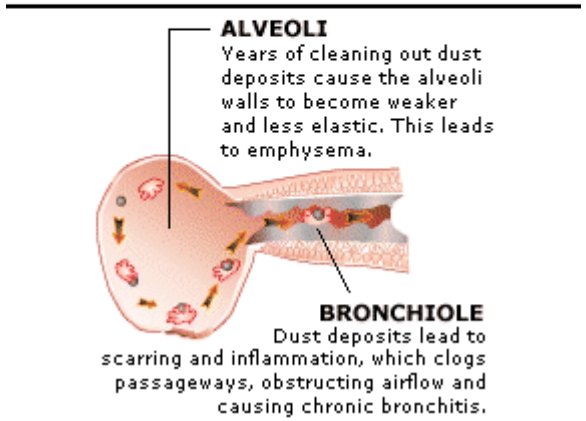
CWP

- If the amount of respirable coal dust exceeds the capacity of mucociliary action and alveolar macrophages to clear it, it will accumulate in the terminal bronchioles.
- The coal laden macrophages and reactive fibrosis creates the coal macule
- Enlargement of the coal macule can weaken the bronchiole wall causing focal emphysematous change
- Coal macules may coalesce



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CWP

- Early lesions are more common in the upper lobes
- Will eventually involve the lower lobes
- Simple disease – radiographic lesions < 10mm diameter
- Complicated disease – radiographic lesions > 10mm diameter
- Most cases require many years of exposure and few develop complicated CWP (also termed PMF)

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CWP – Symptoms and Findings

- Simple CWP
  - Frequently asymptomatic
  - May have cough and sputum – but could also be from general dust inhalation and/or smoking
  - Spirometry
    - → Frequently normal
    - → Mildly restrictive or mildly obstructive

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CWP – Symptoms and Findings

- Complicated CWP
  - Increasing dyspnoea, progressing to dyspnoea at rest
  - Restrictive or mixed pattern on spirometry
  - Reduced diffusing capacity
  - Right heart failure

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Coal Mine Dust Lung Disease (CMDLD)

- Coal mine dust may also contain variable amounts of silica
- Cutting or drilling stone underground or on the surface can dramatically increase the silica exposure
- The symptoms and clinical findings of silicosis are very similar to CWP
- Silicosis can be associated with calcification of mediastinal lymph nodes

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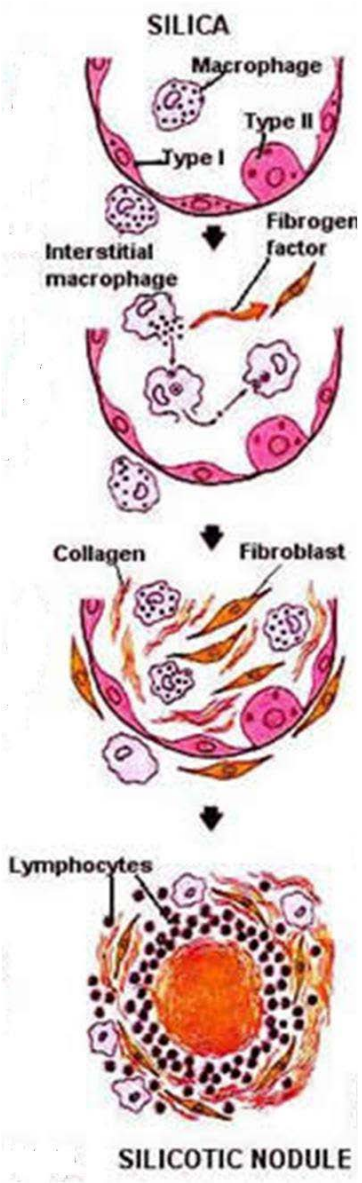
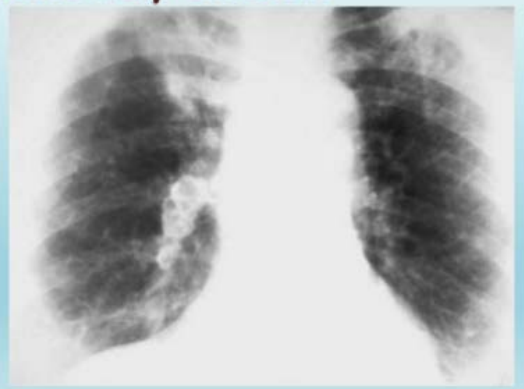
Silicosis



Eggshell calcification – almost exclusively silicosis



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Coal Mine Dust Lung Disease (CMDLD)

- Mixed dust disease
- Chronic bronchitis
- Emphysema
- Progressive loss of lung volume

- Crystalline Silica
  - Diffuse Interstitial Dust Disease
  - Reduce immunity – severe lung infections including TB
  - Auto-immune disease – Rheumatoid arthritis
  - Kidney disease
  - Lung Cancer

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Hazard Creation

- Whenever rock is
  - Drilled
  - Blasted
  - Crushed
- Respirable dust is created
- Will contain variable amounts of crystalline silica
- Workers often do not perceive the hazard

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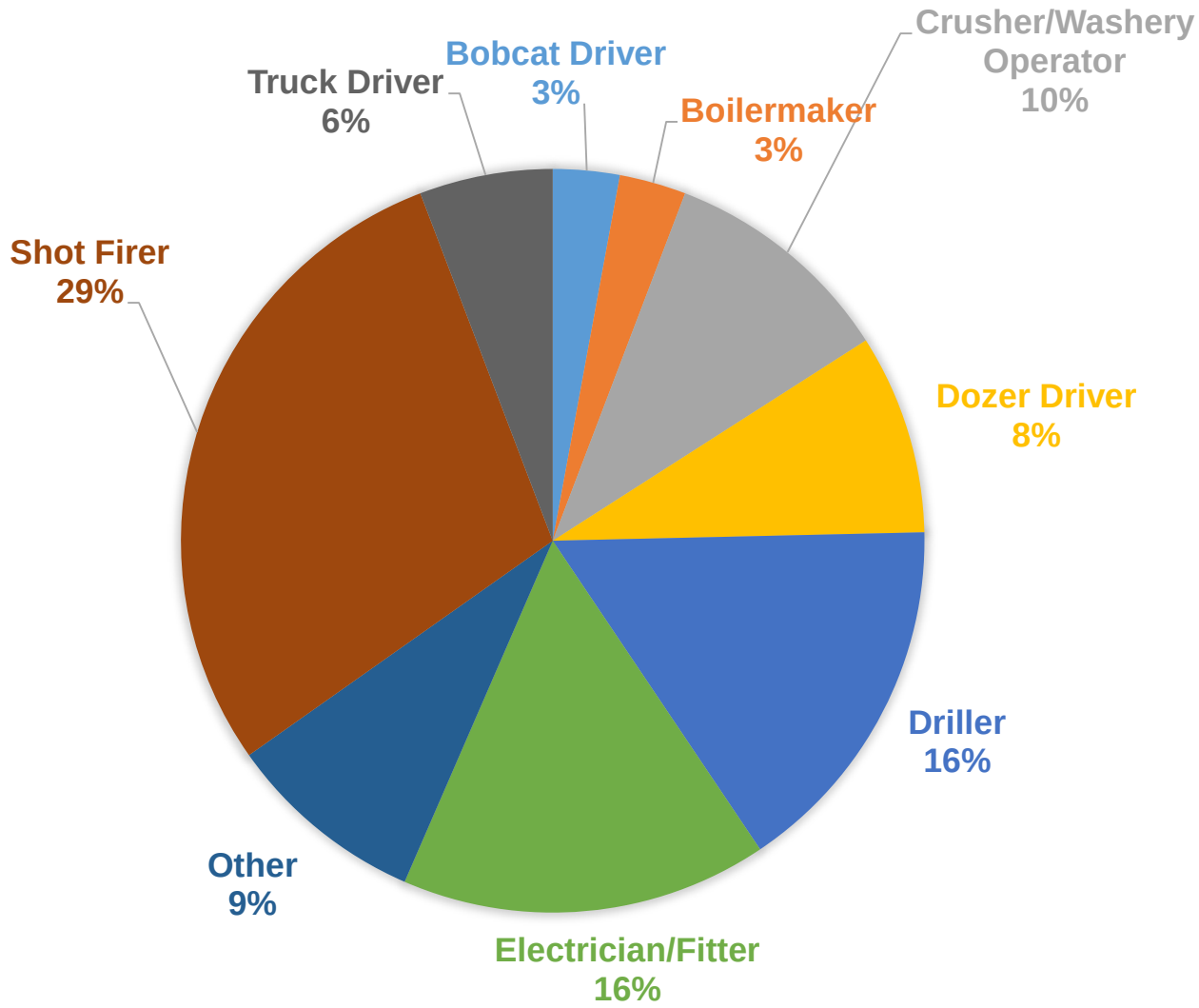
Order 42 Airborne Dust OEL Exceedances by Task Surface Mining Operations 2010 – Aug 2016



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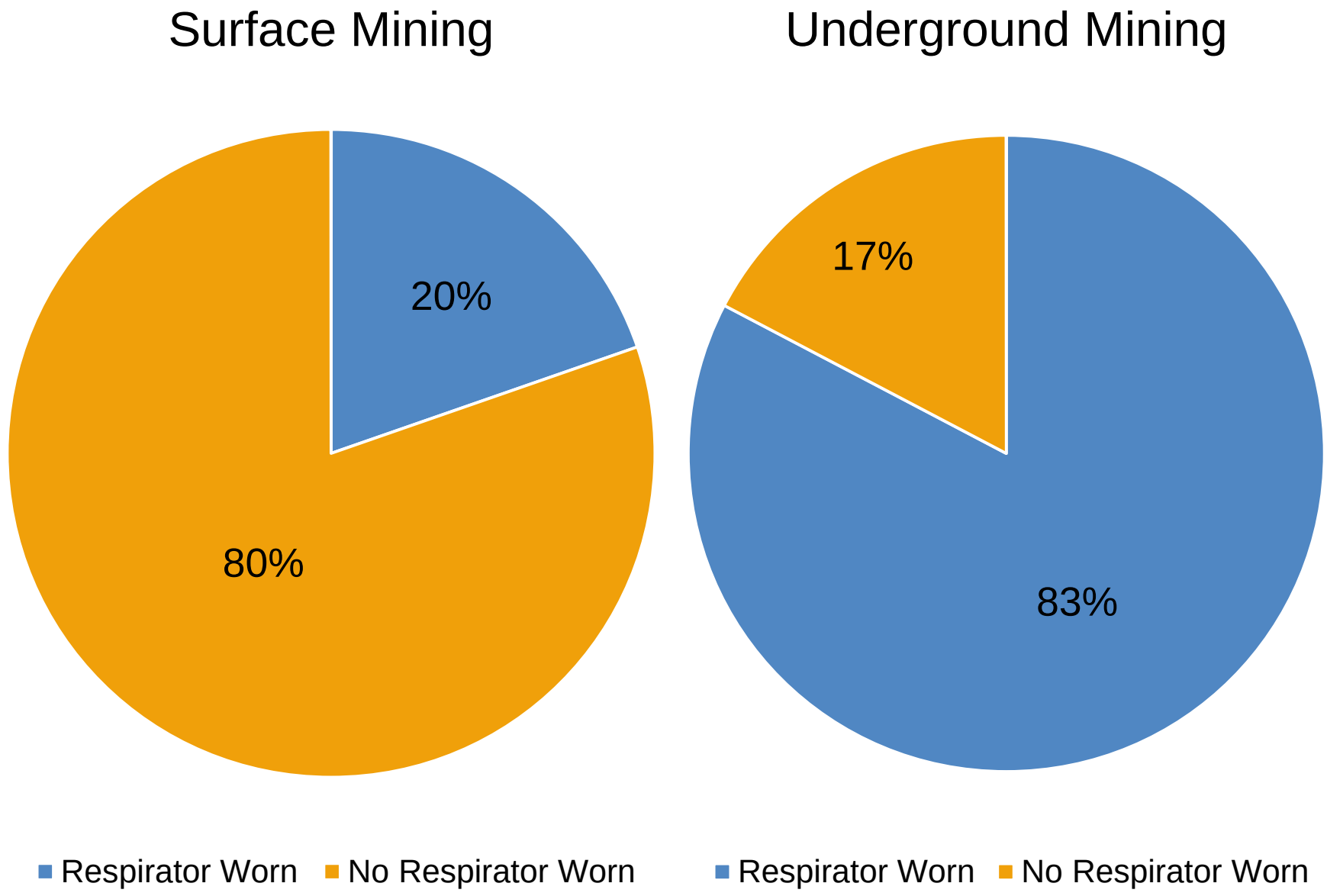
Order 42 Airborne Dust OEL Exceedance by Respirator Use 2010 – Aug 2016



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Monitoring

- Who do you monitor?
  - Where there is a likelihood of 50% of the exposure limit being exceeded
- Australia – crystalline silica 0.1 mg/m³
- US – crystalline silica (OSHA regulated) – 0.05 mg/m³
- Australia - coal dust 2.5 mg/m³

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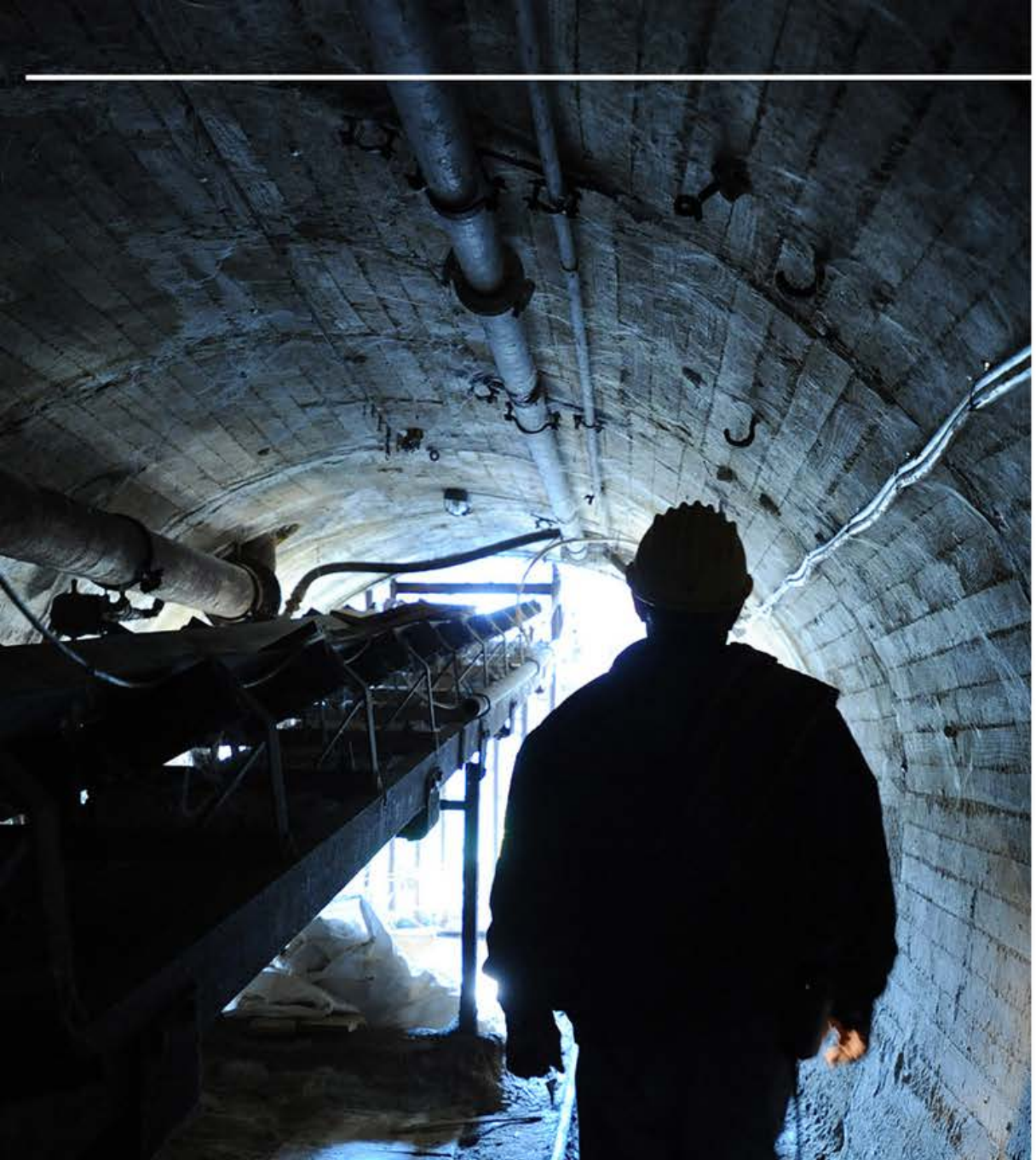
Conclusion

- Whenever a machine or process is created
  - Is this likely to create a dust hazard?
  - Is a human required to be in proximity?
  - Are there alternatives?
  - Are there controls?

Coal Mines
Technical Services



Conclusion

- Dust disease remains
- Extent unknown
- Not just a hazard for underground miners

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