Current and emerging occupational lung diseases

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Disclosures: Deborah H Yates

• Employed part-time by St Vincent’s Public Hospital, Sydney; private practice Holdsworth House Medical Practice, Darlinghurst, Sydney 2010
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• Previous peer-reviewed research funding from: NMHRC, DDB, Novartis, Asthma Foundation, Slater & Gordon, Maurice Blackburn and others
• Previous Deputy Chair, Medical Authority, Dust Disease Board, NSW & Co-Principal Researcher, Dust Diseases Board Research & Education Unit
• Medical Advisor, Coal Services NSW (not salaried)
• Medicolegal work
• I regularly attend Pharmaceutical sponsored talks and eat their lunches, but I do not hold shares in any such companies, nor in any mineral mining companies
Outline of talk

• Introduction
• Spectrum of occupational lung diseases
• Easy fallacies
• Recent events in Australia
• Keeping alert
• Lessons for the future....?
The wide spectrum of occupational lung disorders: inhaled agents can cause almost any lung disorder!

- Airway diseases – asthma, chronic obstructive airways disease, bronchiolitis obliterans
- Parenchymal lung diseases: pneumoconioses (dust diseases), hypersensitivity pneumonitides, respiratory infections
- Pleural diseases: pleural and silica-related plaques, pleural effusion (fluid on the lungs)
- Cancers: lung cancer, laryngeal cancer, mesothelioma
- Rare and new diseases
Exposure to inhaled agents is very common in the workplace

• Risks are NOT proportional to visible dust, fume or vapour

• These are LONG LATENCY diseases ie no or little immediate effect

• May take 15-50 years to develop

• Occupational component can be obscured by pre-existing or developing background lung disease

• Complacency v v common

• Environmental exposures also important
How common are occupational lung disorders in Australia?

- Very poor data
- No centralised collection of information other than for mesothelioma (AMR)
- Long latency diseases therefore long lag-time to diagnosis (if at all)
- Comparatively high burden but not recognised by politicians or community
- Burden of disease underestimated

Current and new challenges in occupational lung diseases. De Mattis et al, European Respiratory Review 2017; 146:art. no. 170080
Common untrue assumptions

- No complaints = no disease
- Respiratory symptoms if present usually due to smoking
- Dust levels within exposure levels = no disease
- No described cases = no cases
- Workers over-interpret symptoms
- These diseases are incurable

PREVENTION IS MUCH, MUCH BETTER THAN CURE
Not all damaging agents are in the workplace, **BUT** effects of other agents are usually additive or multiplicative to workplace exposures, and not the only cause.
Classical occupational diseases are resurging in Australia

- Coal workers’ pneumoconiosis (black lung)
- Silicosis especially artificial stone silicosis
- Allergic sensitisation: Farmer’s lung, thunderstorm asthma etc
- Lung cancer: asbestos, silica, diesel exhaust,

Under recognised:
- Occupational asthma (isocyanates, flour, animals), occupational COPD
- Occupational lung cancers
- Occupational interstitial lung diseases
Black lung inquiry finds 'catastrophic failure' in public administration in Queensland

By Louise Millar, Rachel Nuga and staff
Updated 29 May 2017, 3:59pm

A parliamentary committee into black lung disease has found "catastrophic failings" in public administration in Queensland.

The Black Lung: White Lies report contains 68 recommendations as well as several findings into the re-identification of coal workers pneumoconiosis (CWP), or black lung disease, in Queensland — a disease long thought eradicated.

The re-detection of the illness sparked a widespread inquiry into how regulatory and monitoring systems failed and how to protect workers in the future.
Artificial stone silicosis: A rapidly progressive type of silicosis
Example: The first Australian case of artificial stone-associated silicosis: imaging before and after bilateral lung transplantation (2017)
Example: a case from June 2018: artificial stone silicosis

- Mr L, age 45
- Referred from Bankstown
- Initially studied as an engineer at Sydney Uni but dropped out
- Subsequently started as a kitchen bench-top finisher
- Worked in same job for last 18 yrs
- Married, two children
- Former smoker, 15 pack year; stopped 5 yrs ago
- Unsuitable for transplant; now dead
What about other disorders from respirable crystalline free silica?

• Of the lung:
  • Lung cancer
  • Chronic obstructive pulmonary disease (COPD)
  • Interstitial pulmonary fibrosis
  • Sarcoidosis
  • Obliterative bronchiolitis

Of the rest of the body:
• Joint/skin disease
• Kidney disease
• Other cancers
Asbestos related disorders: still occurring

- Pleural plaques
- Asbestos-related pleural effusion
- Diffuse pleural thickening
- Asbestosis
- Asbestos-related lung cancer
- Mesothelioma
Chronic obstructive pulmonary disease

- COPD an “umbrella” term actually representing many diseases
- Significant advances made in understanding of COPD including occupational and environmental causes

**Chronic bronchitis**
- Chronic productive cough for more than 3 months of the year for two successive years

**Emphysema**
- A chronic, irreversible disease of the lungs characterized by abnormal enlargement of airspaces within the lungs and accompanied by destruction of the tissue lining the walls of the airspaces
Occupational COPD

• COPD due to occupational dust, fume and/or vapour inhalation
• Diagnosis clinically relies on the prior occupational history and also past smoking history, therefore is inherently unreliable
• Consistent evidence from population studies report that the population attributable risk is 10-15% for COPD associated with work exposures
• Occupational COPD cannot be distinguished clinically from non-occupational related COPD
• Well established to be caused by silica, coal, cadmium
• Many other relevant industries with vapours, gases, dusts and fumes e.g: welding, cotton textiles, grain silo workers, isocyanate workers etc etc.
• Standard of care has been developed for occupational COPD (Fishwick et al. *Occupational Medicine* 2015;65: 270-282), but not yet adopted internationally
• Hardly ever recognised in Australia but likely to be quite common
Other lung diseases

- Occupational asthma (>2,000 agents described)
- Hypersensitivity pneumonitis and allergic sensitisations
- Diffuse dust fibrosis
- Pneumococcal pneumonia & other occupational respiratory infections
- Tuberculosis in association with silica exposure
- Very rare diseases e.g. hard metal lung disease

Diffuse dust fibrosis from coal dusts
Occupational lung cancers: often forgotten but can be lethal

<table>
<thead>
<tr>
<th>Cause</th>
<th>Occupation</th>
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<tbody>
<tr>
<td>Asbestos</td>
<td>Mining, processing, usage</td>
</tr>
<tr>
<td>Radioactivity (radon gas)</td>
<td>Metal ore mining, uranium mining, Fluorspar mining</td>
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<tr>
<td>Nickel</td>
<td>Refining</td>
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<tr>
<td>Chromium salts</td>
<td>Extraction, production, usage</td>
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<tr>
<td>Arsenic</td>
<td>Metal refining, chemical industry, insecticides</td>
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<tr>
<td>Chloro-ethers</td>
<td>Organic chemical industry</td>
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<tr>
<td>Mustard gas</td>
<td>Manufacture</td>
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<tr>
<td>Volatile coal products</td>
<td>Coke oven workers</td>
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<tr>
<td>Printing ink(?)</td>
<td>Printing industry</td>
</tr>
</tbody>
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Novel exposures

- Popcorn lung
- Nylon flock lung
- Exposure to thionyl chloride
- Polyamine dyes
- Indium lung
- Ardystil syndrome
- Gulf War syndrome
- World Trade Center disaster

Bronchiolitis obliterans

Geographical Lung: areas of hyperinflated lung and patchy ground glass haziness
Symptoms of work-related disease: the same as any other lung disease; occur LATE

- NONE

- Cough
- Breathlessness
- Wheeze
- Chest pain
- Frequent “chest infections”

Late:
- Coughing up blood
- Weight loss
How we assess lung disease

• History:
  - occupational & medical history
  - specialised questionnaires

• Examination
  - listening to the chest
  - general examination

• Basic investigations:
  - spirometry
  - chest X ray

• Specialised investigations:
  - CT scan, full lung function tests, bronchoscopy, biopsy

Grade 0 I only get breathless with strenuous exercise
Grade 1 I get short of breath when hurrying on level ground or walking up a slight hill
Grade 2 On level ground, I walk slower than people of the same age because of breathlessness, or have to stop for breath when walking at my own pace
Grade 3 I stop for breath after walking about 100 yards or after a few minutes on level ground
Grade 4 I am too breathless to leave the house or I am breathless when dressing
Spirometry

Technique very important; excellent predictor of mortality
ATS/ERS recommendations provide evidence-based best practice
Understanding normal lung function values: new data
Role of surveillance: important. Has to be actually occurring!

**Symptoms**
- Standardized questionnaires
- Many well validated respiratory disease questionnaires now available

**Imaging**
- CT scanning clearly shown to be superior to chest X rays but standardization of technique and interpretation not yet accepted & widely agreed
- Mobile CT scanners now available; low doses and computerized algorithms

**Lung function**
- Spirometry well validated but needs to be performed properly and longitudinal results are far superior to single measurements
- Measurement of DLCO the most sensitive measure of emphysema and again serial measurements preferable
- However, lung function is not specific and therefore the whole clinical picture needs to be considered
- Disruption/anxiety/cost of surveillance measures need also to be taken into account
Conclusions

• Despite excellent knowledge about preventative strategies, occupational diseases are still a huge problem worldwide

• These certainly occur in Australia and are very likely under-recognised

• Old diseases are making a reappearance due to traditional factors (complacency, lack of funding, carelessness, poor education of workers, administration and physicians alike)

• New diseases are likely to occur with new technologies producing novel exposures

• Optimal respiratory surveillance essential

• Despite improving treatments, early diagnosis and removal from exposure is crucial

• We all need to be vigilant, and use global resources and expertise to prevent such diseases

• Such a strategy could save many lives and prevent much suffering