

Occupational Lung Disease
Practical Applications of
The Respiratory Standard

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- Objectives**
1. Review of Occupational Lung Diseases
 2. OSHA Respiratory Standard Refresher
 3. Discuss spirometry in the occupational setting
 4. Discuss practical approach to application of the OSHA Respiratory Standard

- Occupational Pulmonary Disease**
- Significantly under reported
 - One of the top ten causes of occupational disability and death
 - Importance of Recognition and Diagnosis
 - Minimizes health effects and disability
 - Enables appropriate treatment and response (including compensation)
 - Identification to prevent future exposures

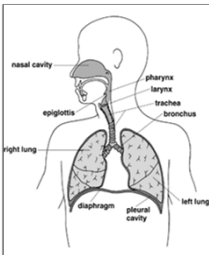
- Respiratory Tract**
- Frequent Site of Injury from Occupational Exposures
 - Responses of Respiratory Tract to Injury
 - Acute include; sinusitis, laryngitis, bronchitis, alveolitis, and pulmonary edema
 - Chronic include; asthma, bronchitis, bronchiolitis, parynchymal fibrosis, bronchiolitis obliterans, pleural fibrosis, and cancer

- Respiratory Tract**
- Size Matters

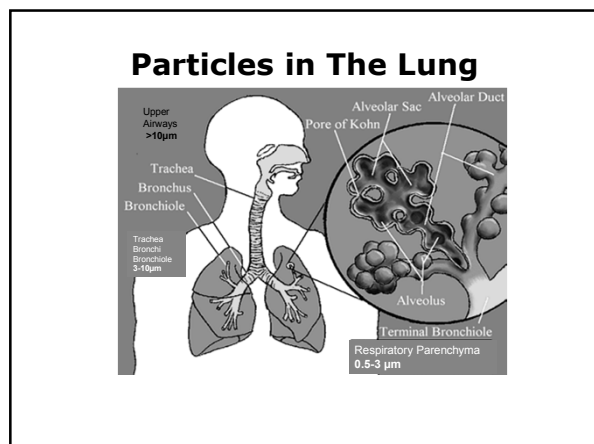
The smaller the particle the deeper it goes in the lung 5µm usually the cutoff between upper and lower airway (metal fumes and asbestos fibers)
 - Solubility Matters

The less water soluble the further down in the lungs the substance goes (phosgene and nitrogen oxides)

Respiratory Tract



| <u>Water Solubility</u> | <u>Level of Impact</u> | <u>Compounds</u> |
|-------------------------|-----------------------------------|--|
| High | Eyes Nose Pharynx Larynx | Aldehydes Ammonia Chlorine Sulfur Dioxide |
| Medium | Trachea Bronchi | Ozone |
| Low | Bronchioles Alveoli | Nitrogen Phosgene |



Being a Good Occ Doc

- Industrial process (onsite visits)
- Job duties and tasks
- Protective equipment?
- Worksite evaluation (ventilation system, enclosed space?)
- Specific chemical exposure (MSDS)
- Physical form of exposure (dust vapor, particulates, etc)
- Understanding health effects of exposure
- History of plant compliance/ monitoring
- Any Prior Problems?
- Employee relations and litigation

Exposures

- Timing of symptoms in relation to work
 - Worse at work or better at home
 - Coincide with introduction of new exposure or change in job description
 - Re-exposure relationship
- Evaluation of non-work exposures
- Home environment
- Recreational activities

Factors for host susceptibility

- Age
- Genetic make-up
- Co-morbid disease
- Nutrition
- Exposure Data
- Atopy
- Race
- Gender
- Cigarette Smoking
- Physical capacity
- Emotional factors

Categories of Occupational Lung Disease

1. Toxic Inhalation Injury (Irritant Reactions)
2. Occupational Asthma
3. Hypersensitivity Pneumonitis
4. Inhalation Fevers
5. Pneumoconioses

Clinical Outcomes of Occupational Lung Disease

1. Asthma
2. COPD
3. Bronchiectasis
4. Bronchiolitis Obliterans
5. Pulmonary Fibrosis
6. Cancer
7. Pleural Disorders

Toxic Inhalation Injury

Short Term Exposures to High Concentrations of noxious gases, fumes or mists

- Think: Firefighting, Spills, Accidents
- Site of injury depends on physical and chemical properties of inhaled agent, size and solubility
- Degree of injury also depends on time of exposure and minute ventilation

Toxic Inhalation Injury

Effects

- Vary depending on agent, concentration exposure time
 - Transient mild irritation of mucous membranes to ARDS
- Long term sequelae may include bronchiectasis, bronchiolitis obliterans and persistent asthma

Toxic Inhalation Injury Evaluation and Management

- What is the causative chemical?
- Physical Findings
 - Look for burning of the nose or throat
 - Hoarseness, Stridor, Wheezing
 - CXR may be normal initially, chemical pneumonitis and ARDS findings 4-8 hour delay
 - ABGs likely to show hypoxemia prior to radiographic findings
 - Observation for at least 24 hours

Toxic Inhalation Injury Evaluation and Management

- Irrigation of exposed cutaneous and conjunctival areas with water
- Laryngoscopy, Bronchoscopy, Spirometry
- Consider intubation if laryngeal edema
- Oxygen, Bronchodilators, ABGS
- Aggressive Bronchial Hygiene
- Steroids, ABX maybe
- Essentially supportive care
- Consider long term follow up of exposed individuals

Train Derailment Kills 9 in 2005



Occupational Asthma

- Is "Asthma caused by exposure to agents encountered primarily (and usually exclusively) in the working environment"

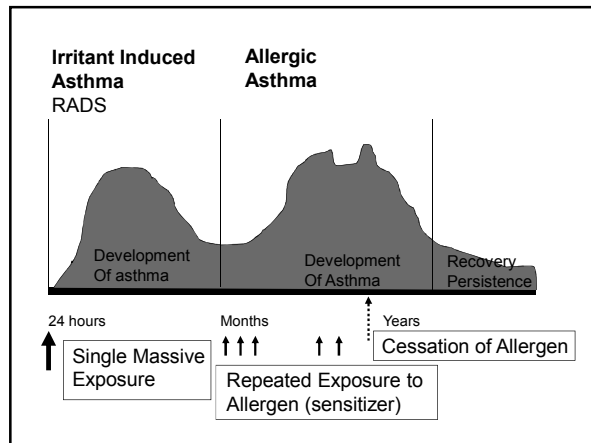
Hendrick, D, Burge, S, Beckett, W, Chung, A. Occupational Disorders of the Lung: Recognition, Management, and Prevention. WB Saunders 2002

Occupational Asthma

- 250 Known Agents and counting
- Asthma affects 5% of general population, 15% of these cases are likely occupational

Types of Occupational Asthma

- Occupational Asthma with a latency period encompasses asthma of immunologic mechanism
- Occupational Asthma without a latency period Immunologic Mechanism is not operative Irritant Induced Asthma (RADS)



Cause and risky jobs for allergic asthma (IgE positive) with latency period

- Bakery workers
- Animal handling
- Metal working operations
- Dusts from flours, grains, gluten, alpha-amylase, mites, molds
- Mouse, rat, guinea pig urine and serum proteins on bedding
- Dusts from tungsten carbide containing cobalt, nickel, platinum, chromium, metal working, fluid aerosols

Cause and risky jobs for allergic asthma (IgE positive) with latency period

- Working in health care facility
- House keeping work
- Food, fish, processing
- Latex gloves, biocides
- Dust from mites, animal dander, molds
- Aerosol/dust of clam, shrimp, lobster, various fish, food additives, spices

Culprits in Occupational Asthma

- Diisocyanates - polyurethane, insulation, upholstery
- Vegetable dusts, Cotton, Hemp Flax and Jute Byssinosis, (Specific Cotton Dust Standard)
- Metal Salts - platinum refining, jewelry making, fluorescent manufacture
- Acid Anhydrides - epoxy resins
- Wood Dusts- woodworkers

Diagnosis of Occupational Asthma

- Suspect in all new adult onset asthma, 50% work related
- Look for temporal relationship with work
- Take a good occupational/recreational history
- Do a good physical, look for eye, nose, OP irritation, lung findings
- CXR, PFT, Methacholine/histamine challenge, PEF, Skin Testing

Management

- A favorable prognosis is dependent upon:
 - ▶ Rapid diagnosis
 - ▶ Early removal
 - ▶ Improvement plateaus two years after cessation of exposure

Remember Hierarchy of Controls

- Drug treatment does not differ from that for non-occupational asthma

Hypersensitivity Pneumonitis

Extrinsic Allergic Alveolitis



Hypersensitivity Pneumonitis

- Immunologically mediated inflammatory disease of the lung parenchyma
- Many antigenic culprits, basic clinical and pathologic findings are similar

Hypersensitivity Pneumonitis

- Lymphocytic alveolitis and granulomatous pneumonitis with resolution if antigen exposure is terminated early
- Continued antigenic exposure can lead to progressive interstitial fibrosis
- Repeated exposure to antigen leads to sensitization and immunologically mediated damage to the lungs

Hypersensitivity Pneumonitis

- Relatively small number of exposed persons develop HP
- TYPE III (immune complexes) and TYPE IV (cell mediated) Hypersensitivity Reactions