Agricultural Respiratory Disease: It’s Not Just Down on the Farm”

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Disclosures

• I have no conflicts to disclose
Objectives

• Describe 5 common agricultural respiratory hazards
• Identify 4 respiratory conditions associated with agricultural dust and gases exposure
• Determine when personal respirators are appropriate for use in the prevention of acute and chronic agricultural respiratory disease
California Agriculture Day

• Happy Agriculture Day
  – March 19, 2014
Air Quality

• California is noted for air pollution
  – 2009 Data showed a great deal of the state did not meet Federal Air Standards.
  
  – 2013 Date showed progress 90% counties
    • High ozone and particulate matter
Respiratory Hazards

• National Respiratory Complaints highest common among farmer

• California Population: 37 million (2011)
  – Rural Population: 5 million
  – Significant Rural Land Mass- Rural Population Spread out
Agriculture Related Jobs

Who besides farmers?
Migrant workers
Produce workers
Nurseries
Landscapers
Veterinarian
California Agriculture
Top Ten

- Milk and Cream
- Almonds
- Grape
- Cattle and Calves
- Nursery
- Hay
- Lettuce
- Walnuts
- Tomatoes
- Flowers and Foliage

2011 Data
Other Commodities
Top Twenty

- Cotton
- Pistachio
- Rice
- Chickens
- Broccoli
- Carrots
- Oranges
- Avocados
- Eggs
Organic Dust

• Complex Mixture
  – Vegetable matter – Pollens – Animal dander
  – Feces - Insect – Bird - Rodent
  – Feather
  – Pesticides – Antibiotics
  – Microorganisms- endotoxins - Molds
    • Bacterial and Fungal cell wall toxins
Inorganic Dust

- Has other elements than the Organic Dust
- Mineral dusts
  - Crystalline silica predominant inorganic material
  - Silicates
  - Quartz
  - Clay
Inorganic Dust

• Primarily Associated with Field Activities
  – Plowing
  – Tilling
  – Haying
  – Harvesting
  – Burning off stubble
  – Burning off grape vines
Inorganic Dust

• Grain Handling – Rice - Cotton

• Manual Harvesting
  – Tree fruit – Grapes
  – Vegetables - Rice – Tree Nuts
Chemical

• Pesticides
• Fertilizers
  • Paints
• Preservatives
• Disinfectant
• Herbicides
Animal and Other Gases

• Primary Concerns
  – Hydrogen sulfide \( (\text{H}_2\text{S}) \)
  – Ammonia \( (\text{NH}_3) \)

• Secondary Concerns
  – Carbon Dioxide \( (\text{CO}_2) \)
  – Methane \( (\text{CH}_4) \)
  – Nitrogen Dioxide \( (\text{NO}_2) \)
Pesticides

• Organophosphates
  – Applicators or field workers

  – Pulmonary symptoms – Muscarinic Effect
    • Excessive bronchial secretions
    • Bronchoconstriction

  – Treatment
    • Airway, Oxygen and Atropine.
Pesticide

• Fumigants
  • methyl bromide, ethylene oxide, phosphine
    – Gases or liquids under pressure
    – Injected into soil
    – Rapidly absorbed in across pulmonary membranes
    – Also absorbed in the skin
Toxic Levels range from respiratory irritant
  - pulmonary edema – cardiogenic shock
Herbicides

- Paraquat – dipyridyl
  - Irreversible pulmonary fibrosis
  - Increased Oxygen enhances toxic effects
  - Low level inhalation does not cause symptoms
  - Pulmonary effects occur 7-14 days post exposure
Zoonotic Infections

• Diseases naturally occurring between
  – Animals and Humans
  – Need to know the types in your service area

Dairy Cattle – Beef Cattle
   Anthrax, Rabies, Foot and Mouth disease

Poultry
   Avian Influenza
Assessing the Patient

• Occupational Health History
• WHACS
  – What do you do?
  – How do you do it?
  – Are you near any dangerous or bothersome things on the farm?
  – Co-Workers with Similar Problems?
  – Satisfied with your job?
Diagnostic Tests

• Pulmonary Functioning
• Chest X-Ray
• ABGS
• Exercise Tolerance Testing
• Oxygen saturation
• Allergy Testing
• Blood and Sputum Cultures for Zoonotic
  (Lung biopsy may be indicated)
Organic Toxic Dust Syndrome

- Most Common – Not widely recognized
- Respiratory and systemic illness
  - exposures to heavy concentrations of organic dusts
- Flu like illness
- Onset 4-6 hours after exposure
  - Silo unloader’s syndrome
ODTS

• Diagnostic Findings
  – Usually Normal $O_2$ saturation and ABGs
  – Chest X-ray is usually normal
  – Elevated WBCs up to 20
  – See a left shift
ODTS

• Antibiotics not necessary
• Treat symptoms
  – Fever Control
  – Rest
  – Prevention - Respirator
Hypersensitivity pneumonitis

• Farmers Lung
  – Caused by exposure to dust from moldy hay, straw, and grain.
  – Prior Exposure and sensitization to allergens
  – Repeated exposure leads to inflammation of lungs
    Acute disease
    Sub Acute
    Chronic
Allergic reaction

1. Initial contact with allergen

2. Plasma cell
   - Released IgE antibodies

3. Mast cell
   - IgE receptor

4. Subsequent contact with allergen

5. Histamine and other chemicals
Hypersensitivity pneumonitis
Symptoms

• Fever
• Chills
• Fatigue
• Breathlessness
• Chest tightness
• Cough
Diagnostic Finding

• Hypoxemia
• May have Infiltrates on Chest X-ray
• CT will show reticulonodular changes
• Slight Increase WBV
• PFT show – restriction and low DLCO
  • DLCO- measures oxygen moves from inhaled air to the red blood cells in the pulmonary capillaries
Hypersensitivity pneumonitis

Acute Farmers Lung Treatment

• Prednisone 60 mg per day x2 weeks then taper
• Shortens the duration of the illness
• Minimal effect on lung function
• Use of respirators with future exposures
• Avoidance of tasks that caused the symptoms
Sub acute farmer’s lung

Symptoms less severe and less clearly related to exposure

Symptoms may last for weeks and may include weight loss

Treatment is prednisone,
  avoidance of exposure
  Change in work practices
  Respirators
Chronic farmer’s lung presents

• Long-standing shortness of breath and dry cough

• Pulmonary fibrosis on lung biopsy

• Cannot be distinguished from most other forms of pulmonary fibrosis
Chronic Farmers Lung

- Chronic farmer’s lung may progress
  - right heart failure and death
- Only curative treatment is lung transplantation
- Supportive treatments include:
  • supplemental oxygen,
  • diuretics,
  • low sodium diet
Nitrogen Dioxide Inhalation

- Related to Silo Fillers Disease
- Nitrogen Dioxide (NO₂)
- Forms rapidly within hours of filling Silo
- NO₂ predominant gas peak 5-7 days
- Inhalation – inflames lungs
  - Loss of Consciousness
  - Permanent scarring lungs
Nitrogen Dioxide Inhalation

• Mild Exposure
  – Cough, bronchospasm, nausea

• Continued Exposure
  – Pleuritic chest pain, dyspnea, pulmonary edema

• High Concentrations
  – Immediate LOC and pulmonary edema
  – Pulmonary fibrosis
Nitrogen Dioxide Inhalation

• Treatment
• Low Exposure
  – Remove from exposure, prednisone, baseline CXR

• Higher Concentrations
  – 100% humidified O₂, IV Steroids,
  – Nebulizer – Bronchodilators, ABGS
  – May need Intubated – Develop ARDS
Nitrogen Dioxide Inhalation

• Prevention
  – Do not enter Silo 10-14 days post filling
  – Run blowers 30 minutes before entering
  – Always have Spotter – Rescue Line
  – Recommend Self Contained Breathing Apparatus
Carbon Monoxide

• Exposure
• Diagnosis – Carboxyhemoglobin level
• Treatment 100% O₂, may need hyperbaric
  – Heaters
  – Running engines in Shops and Barns
  – Gasoline powered pressure washer
    • Animal confinement
Asthma Like Syndrome

• Seen in:
  – poultry barn workers

• Associated with exposure to dust endotoxin
  – dust,
  – ammonia
Asthma Like Syndrome

- Symptoms include:
  - Cough - chest tightness - shortness of breath on exertion
- Lung function tests:
  - normal
  - show mild airway obstruction
- Chest X-ray essentially negative
- This is not allergic disease
  - Fewer allergies seen in these workers
- Caused by
  - endotoxin, ammonia and dust
Asthma Like Syndrome

• Symptoms
• Work history
• Lung function tests
Asthma Like Syndrome
Treatment

• Reduce or avoid exposure
• Wear a respirator
  – especially when loading and
  – power washing
• But do not have the affected person do high exposure tasks
  Like power washing of buildings
• Optimize ventilation in barns
• If nothing else helps, consider changing jobs
• Medications used for asthma usually not
  effective for this condition
Farmers with Asthma

- Exposures:
  - confinement barns - grain dust
  - may significantly worsen asthma
    - also COPD symptoms
Farmers with asthma

• Reducing exposures that cause symptoms

• Respirators

• Change in work practices

• May need asthma medications increased during times of heavy exposure to dust, like harvest
Chronic Bronchitis

• Daily Cough
  – 3 months/year for at least 2 year
  – Prevalence 25%-50% animal/grain production workers
  – Highest in Swine workers
  – Cigarette smoking contributes
  – Respiratory protection – smoking cessation-reducing levels of dust and gas in operation
Sinusitis

• Common in workers
  – 25% swine confinement
  – 20-50% animal confinement
  – Rhinitis
    • Allergic vs. bacterial sinusitis
    • X-ray – CT- Nasal Scraping – Allergy testing
    • Treat symptoms
    • Reduce exposure
    • Antibiotics not routine
Respiratory Protective Equipment

• Fit Test
  – must be able to provide adequate protection if
  – can't protect the wearer if it leaks
  – ensure that the equipment selected is suitable for the wearer.
  – perform at initial selection stage
  – conducted by a competent person
  – Should be checked annually
Contraindications Respirator

- Moderate to severe
  - COPD – Asthma - Emphysema
- Angina – Recent MI- CHF
- Periodic LOC
  - Uncontrolled Seizures or Diabetes (hypoglycemia)
- Claustrophobia
- Inadequate Fit Test
  - Facial Deformities – Dentures – Facial Hair
Personal Protective Equipment

Respirators

• Person Respirators- Filters the air
  – Double strap respirators recommended

• Respiratory protection factor (RPF)= 16
  – 3 sizes low cost $3.00
  – with charcoal to absorb ammonia
  – for use in hog or poultry barns
Respirators
RPF = 19

Filters the Air
Different filters
  handling grain
  spray painting
  application of
  anhydrous ammonia

Breathe against resistance
  more difficult with
  asthma or COPD

Initial cost - Approximately -$35
  then replace the filters
Powered Air Purifying Respirator
RPF = 30

Self Contained Breathing Apparatus

Advantages:

• Don’t have to breathe against Resistance

• Higher protective factor, works when other respirators do not fit

• Cost - $1000 and higher
Reducing Exposure

• Respirators

• Avoid Exposure – Delegate to persons who are not sensitized or do not have acute problems

• Mechanize feeding systems to decrease direct contact.
Reducing Exposure

- Emission Control – Keep Dust Out
- Remove Dust once it is there
- Protection with PPI
- Modifying work to decrease exposure
- Educate workers
- Medical Monitoring
- Smoking cessation
Prevention Measures

• New Equipment
  – Tractors – Combines: Air filtration closed Cabs
    • Need to change filters

• Smoking Cessation

• Yearly monitoring with high risk patients
  – COPD, Chronic Farmers Lung
Education

• Who needs Educated?
  – Employer
  – Patient
  – Community
Conclusion

• Respiratory Agriculture disease should be part of Differential Diagnosis
• Occupational history important part of assessment
• Symptoms are often vague and can be mistake for viral or bacterial bronchitis
Conclusion

Nurse Practitioners can play an important role in treatment and prevention of disabilities

Agriculture Respiratory Disease
Resources

• [http://www.cdc.gov/niosh/topics/respirators/](http://www.cdc.gov/niosh/topics/respirators/)

• [http://agrisafe.org/farmers/](http://agrisafe.org/farmers/)


• [http://www.worh.org/files/AgHealth/resp.pdf](http://www.worh.org/files/AgHealth/resp.pdf)
  – Wisconsin Program – Excellent Resource
Resources

• https://www.osha.gov/SLTC/respiratoryprotection/index.html

• http://www.cdc.gov/niosh/topics/surveillance/ORDS/