

SENSOR Occupational Lung Disease Bulletin

A project of the Massachusetts Department of Public Health's Occupational Health Surveillance Program, the Massachusetts Thoracic Society, and the Massachusetts Allergy Society

Massachusetts Department of Public Health, Occupational Health Surveillance Program, 6th floor, 250 Washington Street, Boston, MA 02108, Tel: (617) 624-5632, Fax: (617) 624-5696

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Dear Health Care Professional,

In this issue we present a case study involving a relatively new lung disease known as flock workers' lung. The flocking industry produces fleeced fabric for use in the manufacture of automobile and other upholstery, carpeting, and novelty items. There are at least 4 flock manufacturers in Massachusetts and 65 additional companies share the Standard Industrial Classification (SIC) code that includes flock manufacturing. Workers in this industry may be exposed to very short fibers cut from synthetic or natural materials and as a result of this exposure, may be at increased risk for developing chronic interstitial lung disease

Many thanks to Dr. Tom Hicks for sharing this case study with us.

Sincerely,
Catharine Tumpowsky, MPH
Occupational Lung Disease Surveillance Project

Flock Worker's Lung: a case study

Case history

The patient, a 41-year old non-smoking maintenance worker at a nylon flock manufacturer in Massachusetts, initially presented to his primary care physician approximately 6 years ago with a persistent cough. He was diagnosed with new onset of asthma and treated with a metered dose beta-agonist inhaler without significant improvement.

In the spring of 1995, the symptoms progressed. He noted cough and shortness of breath after running short distances. The cough was productive of yellow-green sputum. In the summer of 1995, he developed significantly increased shortness of breath that he noted when speaking. He was referred to the pulmonary clinic at UMass Medical Center. The patient denied any signs or symptoms consistent with GERD (gastroesophageal reflux disease). There was no history of chest pain, chest tightness, hemoptysis, orthopnea or paroxysmal nocturnal dyspnea. He had a postnasal drip, which was treated with a combination of nasal steroids, antihistamines, and decongestant. There was no improvement on these medications.

His pulmonary function testing showed an FVC of 2.89 liters (58% predicted), FEV₁ of 2.31 liters (61% predicted); FEV₁/FVC was 80%. His total lung capacity was 75% of

predicted and diffusing capacity/alveolar volume was 73% predicted. A methacholine challenge test was positive. A high resolution CT scan was performed and showed diffuse alveolitis that appeared to be worse in the superior segment of the left lower lobe and the anterior segment of the left upper lobe. The patient had a negative PPD and sputum was negative for acid-fast bacillus. Room air oximetry showed 93% saturation at rest and after walking 850 feet in 5 minutes, desaturated to 88%.

The patient had a biopsy performed of the anterior segment of the left upper lobe. The initial report of the lung biopsy was usual interstitial pneumonitis with fibrosis. The differential diagnosis at the time was usual interstitial fibrosis possibly secondary to sarcoid, hypersensitivity pneumonitis, or idiopathic pneumonitis fibrosis. He was started on oral prednisone.

At follow-up three weeks later the patient reported improvement in his shortness of breath. Forced vital capacity improved to 3.49 liters and FEV₁ improved to 2.7 liters with a diffusing capacity of 88% percent and FEV₁/FVC of 77%.

The patient had a work-up for IgE and IgG antibodies to aspergillus that were negative. A hypersensitivity pneumonitis screen revealed weakly positive precipitants to thermophilic actinomycetes and aspergillus fumigatus.

The patient remained on prednisone and was temporarily out of work. During this time, he improved symptomatically and there was also improvement and stabilization of his pulmonary function testing. Upon return to work, he became increasingly short of breath. He also had worsening of his pulmonary function studies and slight worsening in his chest x-ray showing a diffuse but patchy infiltrate. He was started on Methotrexate and symptomatically improved.

The patient's physicians at the pulmonary clinic referred him to the occupational medicine clinic at UMass Medical Center. As part of his evaluation, a worksite evaluation was performed. This site visit occurred prior to publication of further data on flock industry workers and limited information on the association between flock and lung disease was available at the time. Given this, other substances were considered including welding and soldering fumes and titanium dioxide. While the medical literature noted possible

REPORT APRIL-JUNE CASES NOW
By July 31st, report all occupational lung disease cases seen for the first time between April and June 2000. If you have NOT seen any cases, it is not necessary to return the report form.

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associations with interstitial fibrosis, no association with these substances and the patient's pulmonary symptoms could be established.

Discussion

Flock workers' lung disease is a chronic nongranulomatous interstitial lung disease that is seen in workers in the nylon flocking industry. Differential diagnoses include sarcoid, hypersensitivity pneumonitis, and idiopathic interstitial fibrosis.

In the flocking industry, short fibers (flock) are cut from long cables of parallel monofilaments of nylon, rayon, or polyester. The fibers are cut with either a guillotine device or a rotary cutter. Rotary cutters generate fibers that are less precisely defined in length compared to guillotine cut fibers. The fibers are approximately 0.2 to 5 millimeters in length. The fibers (before cutting) are impregnated with titanium dioxide delusterant. The flock is dyed, finished, dried, screened, and then bagged. The cut flock is then applied to a moving polyester fabric which has an acrylic adhesive applied to it. Based on an applied electrostatic charge and vibration by beater bars, the flock is embedded into the adhesive. The fabric with the applied flock is heat cured and after this the flocked fabric may be subjected to finishing, embossing, and printing. The final product is used in a variety of applications including automobile and other upholstery, carpeting, apparel, and novelty items.^{1,2}

The first published reports of interstitial lung disease in workers occupationally exposed to nylon occurred in 1973.³ Since then there have been case reports of interstitial lung disease in the nylon flocking industry.² Although the specific cause of flock workers' lung disease is unknown, it is suspected that respirable nylon fibers from the rotary cutting of the nylon tow is responsible for this condition. The typical symptoms in these patients are chronic dyspnea and a non-productive cough with or without atypical chest pain.² Physical examination typically reveals crackles on auscultation of the chest. Pulmonary function testing generally shows a restrictive lung disease with decreased diffusion capacity. Chest radiographs are inconsistent, however, high-resolution CT scan (HRCT) is the most sensitive test to detect early flock workers' lung disease. Biopsies of these patients are variable with most patients showing nodular peribronchovascular, lymphocytic infiltrates with diffuse lymphocytic interstitial infiltrates, germinal centers, and lymphocytic bronchiolitis. Treatment consists of oral corticosteroids and immunosuppressive agents. The most important advice to these patients regarding treatment is removal from exposure. If these workers are recognized early with early removal from exposure, there is a good prognosis for no further progression of their lung disease. If the diagnosis is delayed, irreversible, lung disease may result and continued exposure generally results in worsening of their lung disease.²

Health Hazard Evaluations

In November 1998, the National Institute for Occupational Safety and Health conducted health hazard

evaluations of two New England flock manufacturing facilities

These evaluations were requested by management because workers in another flock plant in Rhode Island had been diagnosed with flock workers' lung.

The NIOSH investigations consisted of symptom and work history surveys and personal and area sampling for respirable dust and fiber counts.

The NIOSH HHEs found that respirable particles and fibers were present in air samples. The process of cleaning with compressed air (blow-down cleaning) resulted in the highest dust concentrations measured in the worksites and was associated with an excess of fever/aches and cough/phlegm.

As a result of their investigations, NIOSH recommended that dust exposures be reduced by eliminating the use of blow-downs as a means of cleaning and by changing the flock-loading processes. Until engineering controls could be put in place, NIOSH recommended that workers use personal respiratory protection.

References:

1. Kern DG, Crausman RS, Durand KTH, Nayer A, Kuhn III C. Flock worker's lung: chronic interstitial lung disease in the nylon flocking industry. *Ann Intern Med.* 1998;129: 261-272.
2. Kern DG, Kuhn III, Ely W, Pransky G, Mello CJ, Fraire AE, Miller J. Flock worker's lung. *Chest* 2000; 117:251-259.
3. Pimental JC, Avila R, Lourenco AG. Respiratory disease caused by synthetic fibers: a new occupational disease. *Thorax.* 1975; 30:204-219.

Editorial note: Dr. David Kern is the physician who discovered this disease and brought the information into the public health discourse. He was subsequently dismissed from his faculty position at the medical school and the occupational medicine clinic at the hospital where he worked was closed. The employer of the affected workers opposed the release of

Free Asthma Medications

Information on obtaining free asthma and allergy medications for indigent patients can be found on the American Society of Health-System Pharmacists (ASHP) website - www.ashp.org/public/news/breaking/asthma.html. Forty-five drugs are listed alphabetically, with information on the manufacturer, whom to contact, who initiates a request, the health provider's role, the patient's role, and how the drug is dispensed. Please share this information with those who might be able to use it.

information about the disease.

Number of Work-Related Asthma Cases Reported to Massachusetts SENSOR, March 1992-March 2000

January 2000	February 2000	March 2000	Total to Date (3/92-3/00)
1	4	29*	765

* Most of these cases (n=22) were reported by one occupational health clinic, which reports on a quarterly basis.
