

**OCCUPATIONAL LUNG DISEASE IN WORKERS
EXPOSED TO NYLON FLOCK: PATHOLOGIC
FEATURES AND DISTINCTIVE LESIONS**
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Introduction

Synthetic flocked fabric made from nylon, rayon or polyester is used in many industrial applications. A number of sporadic illnesses have been reported in the flocking industry during the last decade. Symptoms included interstitial pneumonitis, changes in pulmonary function, lymphocytic infiltration and mild fibrosis. Health Hazard Evaluations conducted by the National Institute for Occupational Safety and Health (NIOSH) failed to identify a specific set of symptoms or an explicit etiologic agent. However, when the affected workers were isolated from workplace exposure, their symptoms diminished. In contrast, if occupational exposure continued, the symptoms worsened. In view of these insights, and because the specific etiology of this disease remained unidentified, NIOSH organized a review in January 1998 of all the lung biopsies available from cases with work histories in the flocking industry. From a total number of 20 cases, 15 biopsies were reviewed by six pathologists to assess the type, severity and pattern of pulmonary inflammation, pulmonary lesions, fibrosis and other changes. These histopathological studies revealed a characteristic peribronchitis lesion associated with lymphoid hyperplasia and abrogates. The pattern and transient nature of this distinctive lesion was suggestive of the toxicologic and immunologic nature of the etiologic agent. To evaluate the characteristic inflammatory response, we conducted short term in vivo studies in rats intratracheally exposed to a single dose of nylon dust, washed airborne dust and soluble fraction of the dust. Significant findings of these histopathological studies and toxicologic studies are presented here.

Human Studies

- Acute inflammation of several small airways and occasional large airways with bronchitis and peribronchial lymphoid hyperplasia was very characteristic in many cases. This lesion was collectively described by the panel of pathologists as “lymphocytic bronchitis and peribronchitis with lymphoid hyperplasia”.
- No granulomata were found in any of the lung tissues evaluated.

- Mild interstitial fibrosis, lymphoid hyperplasia, desquamative diffuse alveolar damage and bronchitis obliterans were present in a few cases.
- Some of these distinctive patterns of pulmonary reactions were suggestive of a chronic immunologic response associated with exposure to a respirable toxic agent.

In Vivo Animal Studies

- Thoracic dust samples collected from a nylon flock processing plant contained shreds of nylon flock dust.
- Nylon flock dust as well as the washed nylon dust caused an inflammatory response in rats. The water extract was much less inflammatory than the nylon flock dust. This was suggestive that nylon shreds may contribute to the inflammatory response.
- Nylon flock dust caused an acute inflammatory response (recruitment of neutrophils) at one day post exposure, but this inflammation declined to control levels after 29 days.
- Consistent with these findings histopathologic evaluation of the lungs in rats exposed to nylon flock after one day showed inflammation predominated by neutrophils. There was no fibrosis nor inflammation after 29 days. However, occasional birefringent fibers were present surrounded by a number of histiocytic cells.

Conclusions

- A characteristic pattern of inflammatory pulmonary response was present in workers exposed to flock dust. The lesion is descriptively termed as lymphocytic bronchitis and peribronchitis with lymphoid hyperplasia.
- This pulmonary response is suggestive of an immunologic response to the flock dust.
- Animal studies support the inflammatory potential of the flock dust.
- Available human and animal studies suggests that flock dust, containing nylon shreds, is probably associated with the interstitial lung disease reported in flock workers and may cause adverse health effects with continued exposure.

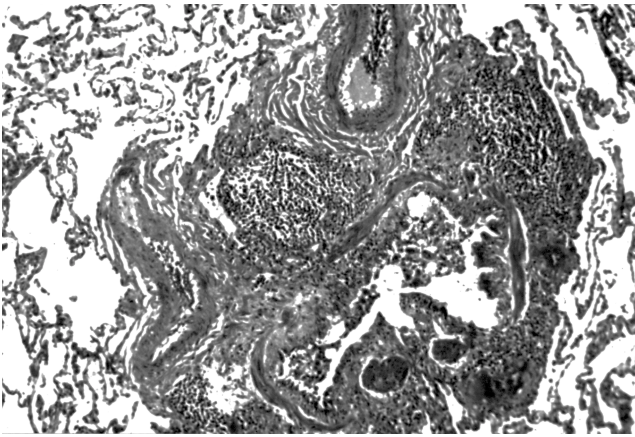


Figure 1. Photomicrograph of lung biopsy obtained from a flock worker showing extensive lymphocytic infiltration of the bronchiolar walls (bronchiolitis) associated with peribronchiolar infiltration of lymphocytes (peribronchiolitis) and cellular debris in the lumen reactive changes in the mucosal walls. This type of lesion was characteristic in many flock workers and is called *lymphocytic bronchiolitis*.

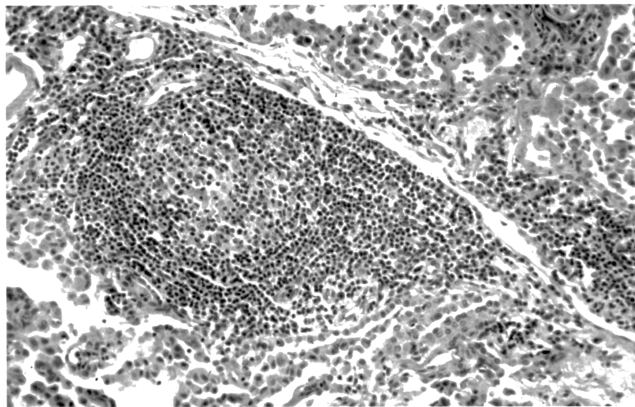


Figure 2. Photomicrograph of lung biopsy obtained from a flock worker showing a lymphoid follicle formation. Alveolar macrophages and lymphocytes are prominent in the interstitium.



Figure 3. Photomicrograph of the lung biopsy obtained from a flock worker showing diffuse interstitial inflammation adjacent to airways, lymphoid aggregates and mild interstitial fibrosis.

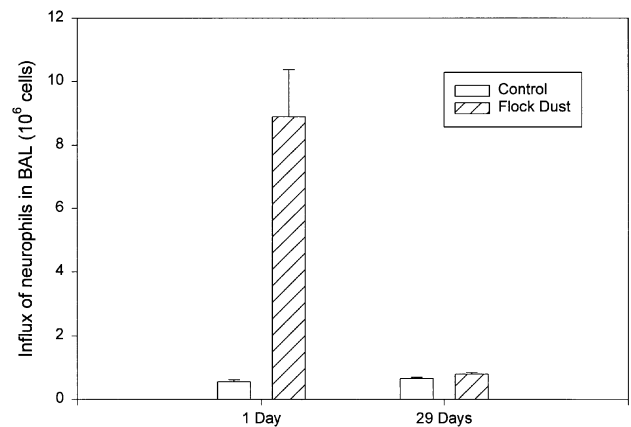


Figure 4. Neutrophil cell counts in rats after administration of airborne flock dust compared to controls at 1 and 29 days post-exposure.