

*Measles Pneumonitis — Continued*

<200 for persons aged  $\geq 6$  years; or 2) CD4+ T-lymphocytes constituting <15% of total lymphocytes for children aged <13 years (8,9).

ACIP continues to recommend MMR for HIV-infected persons without evidence of measles immunity (5) who are not severely immunocompromised (8,9). Severely immunocompromised HIV-infected patients who are exposed to measles should receive immune globulin (IG), regardless of prior vaccination status (1). In addition, health-care providers should weigh the risks and benefits of measles vaccination or IG prophylaxis for severely immunocompromised HIV-infected patients who are at risk for measles exposure because of outbreaks or international travel.

Because the immunologic response to both live and killed antigen vaccines may decrease as HIV disease progresses (1,10), vaccination early in the course of HIV infection may be more likely to induce an immune response. Therefore, HIV-infected infants without severe immunosuppression should routinely receive MMR as soon as possible after their first birthday. Evaluation and testing of asymptomatic persons to identify HIV infection are not necessary before deciding to administer MMR or other measles-containing vaccine (1).

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### **Biopsy-Confirmed Hypersensitivity Pneumonitis in Automobile Production Workers Exposed to Metalworking Fluids — Michigan, 1994–1995**

In 1994, union and management officials and local physicians in southeastern Michigan noted the occurrence among automobile production workers of respiratory illness consistent with hypersensitivity pneumonitis (HP). Local and national health authorities reviewed medical records, and in June 1994, individual employees and the union requested that CDC's National Institute for Occupational Safety and Health

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(NIOSH) evaluate potential occupational exposures associated with these illnesses. This report summarizes preliminary findings of the evaluation, including detailed information about one HP case and a summary description of the six biopsy-confirmed cases among automobile production workers from three different plants (plants A, B, and C) in southeastern Michigan; all six workers had jobs that entailed frequent exposure to metalworking fluids (MWFs). The findings suggest the need for further evaluation of a possible association of occupational exposure to MWFs with HP.

**Case Report**

In February 1994, a 57-year-old man (patient 1) was evaluated for a 7-month history of wheezing, dyspnea, weight loss, fever, and productive cough. He had worked as a toolmaker at plant A for 11 years and had not smoked cigarettes for the preceding 28 years. His symptoms were temporally related to working in an area of the plant where soluble machining oils—a type of MWF—were used. The worker's respiratory illness progressed, and in May, he was hospitalized for acute respiratory failure. Findings on admission included basilar inspiratory crackles, and a chest radiograph indicated bilateral interstitial infiltrates. Oxygen tension on room air at rest was 53 torr (normal: 80–100 torr) with 82% saturation; a white blood cell count was 11,900 (normal: 4800–10,800) with a normal differential. Fiberoptic bronchoscopy and examination of tissue specimens obtained by transbronchial biopsies demonstrated multiple noncaseating granulomas with lymphocytic infiltration of the alveolar septa—findings consistent with HP.

Following diagnosis of HP, the patient was treated with oral corticosteroids and was removed from work for medical reasons. Pulmonary function tests (PFTs) obtained in May indicated a forced vital capacity of 3.8 L (75% of predicted; normal: >80% predicted), total lung capacity (TLC) of 5.7 L (79% of predicted; normal: >80% predicted), and diffusing capacity for carbon monoxide (DL<sub>CO</sub>) of 18.79 (67% of predicted; normal: >80% predicted). Subsequent PFTs obtained in March 1995 showed a normal TLC (6.9 L [93% of predicted]) and DL<sub>CO</sub> (24.85 [89% of predicted]).

**Case Summaries**

During 1994–1995, physicians at two local pulmonary and occupational medicine clinics in Michigan reported four cases of biopsy-confirmed HP (including patient 1) among workers from three different automotive plants. A subsequent review of the medical records of plant employees who had sought medical attention identified two additional biopsy-confirmed cases. In addition, 14 probable cases (not biopsy-confirmed) were identified.

All six persons with biopsy-confirmed cases (Table 1) were nonsmokers for at least 12 years preceding illness. All except one reported recurrent respiratory and systemic symptoms that were temporally related to working in areas of their respective plants in which MWFs were used: the symptoms of one worker (patient 3) resolved after he was permanently removed from the workplace for medical reasons; the symptoms did not recur. MWFs were the only potential exposures previously associated with HP to be identified by the investigation. One worker (patient 5) had a 1½-year history of interstitial lung disease and work-related symptoms of dyspnea and cough; this worker died as a result of acute myocardial infarction, and autopsy findings indicated the presence of chronic granulomatous lung disease. Serum precipitins to a standard commercial antigen panel (including bacteria, fungi, and avian proteins that have

**TABLE 1. Clinical findings for six automobile production workers\* with hypersensitivity pneumonitis — production plants A, B and C, Michigan, 1994–1995**

Patient <sup>§</sup>	Plant	Job title	Work-related symptoms <sup>¶</sup>	Physical examination	Initial pulmonary function (% predicted) <sup>†</sup>					Biopsy
					CXR/HRCT**	FEV <sub>1</sub>	FVC	TLC	DL <sub>CO</sub>	
1 <sup>††</sup>	A	Toolmaker	Wheeze, dyspnea, cough/sputum, and weight loss	Basilar crackles	Bilateral interstitial infiltrates	76	75	79	67	Noncaseating granulomas
2	B	Machining supervisor	Dyspnea, chills, fatigue, diaphoresis, and cough	Clear	Interstitial process/pulmonary fibrosis	79	74	85	41	Granulomas, lymphocytic infiltrate
3	B	Grinder	Cough/sputum and chills	Basilar crackles	Ground glass opacification	45	61	210	90	Noncaseating granulomas, interstitial pneumonitis
4	B	Metal machine repair	Dyspnea, myalgias, chills, and headache	Basilar crackles	Decreased lung volumes; increased bronchovascular markings	D <sup>§§</sup>	D	D	NA <sup>¶¶</sup>	Granulomatous interstitial pneumonitis
5	C	Machinist	Dyspnea	Clear	Interstitial pattern; thickening of interlobular septa	72	94	80	44	Granulomas at autopsy
6	C	Carpenter	Cough/sputum, dyspnea, and weight loss	Basilar crackles	Basilar interstitial pattern	83	81	84	60	Granulomatous pneumonitis

\* All workers exposed to water-based metalworking fluid aerosols during work.

<sup>†</sup> FEV<sub>1</sub>=forced expiratory volume at one second (normal: >80% predicted); FVC=forced vital capacity (normal: >80% predicted); TLC=total lung capacity (normal: >80% predicted); DL<sub>CO</sub>=diffusion capacity for carbon monoxide (normal: >80% predicted).

<sup>§</sup> Workers were aged 35–60 years; all were nonsmokers for at least the previous 12 years.

<sup>¶</sup> Symptoms temporally related to the workplace.

\*\* Chest radiograph and/or high-resolution computed tomography scan of lungs.

<sup>††</sup> Patient described in text.

<sup>§§</sup> Test result recorded only as “decreased.”

<sup>¶¶</sup> Records not available.

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been associated with HP in other settings) were negative in the two workers who were tested. Pulmonary function abnormalities among the six workers included decreased DLco (patients 2, 5, and 6) and spirometric patterns consistent with restrictive defects (patients 1 and 2) or mixed restrictive/obstructive defects (patients 3 and 5).<sup>\*</sup> Following removal from exposure to MWFs and other medical treatment, pulmonary function improved in all six workers.

Investigators are continuing evaluation of the workers at these plants, including further follow-up of the workers in whom HP was diagnosed, additional case finding, exposure assessments, and a prospective evaluation of respiratory and systemic symptoms among workers exposed to MWFs.

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**Editorial Note:** HP (also known as extrinsic allergic alveolitis) is a diffuse interstitial granulomatous lung disease thought to involve an immunologic reaction of the lung to repeated inhalation of foreign antigens. Numerous antigens have been associated with HP, including many types of bacteria and fungi, animal proteins, and low molecular weight chemicals (1). Farmer's lung, a prototypical form of HP, has been associated with exposure to thermophilic bacteria and several fungal species. Because the presence of precipitating antibodies in serum reflects past exposure to the corresponding antigens, testing serum for precipitating antibodies against suspected antigens may be included in the diagnostic evaluation for HP.

Although the findings in this report suggest a link between occupational exposure to MWFs and HP, the ability to assess a causal association is subject to at least four limitations. First, these cases may not be representative of all HP cases among workers at the three plants because cases were not identified systematically from a defined population, diagnosis of HP is difficult, and symptoms of HP mimic those of other more commonly diagnosed diseases (e.g., bronchitis or pneumonia). Second, actual exposures to MWFs were not measured. Third, this analysis did not estimate HP prevalences and incidences at the three manufacturing plants; such estimates have been calculated in specific occupationally exposed populations, but overall rates are unknown. Finally, no specific antigen(s) has been associated with these cases. Precipitating antibodies were absent in the two workers who were tested; however, this may reflect the complexity of microbial species contamination or an antigen profile in MWFs that differs from those included in standard testing panels.

NIOSH estimates that approximately 1 million U.S. workers are potentially exposed to MWFs (2). These fluids are used in a variety of industries to reduce friction between cutting tools and work surfaces and to remove material residue and heat from work surfaces during cutting or machining operations. MWFs are categorized into three major classes: straight (insoluble) oils, soluble (emulsified) oils, and synthetic fluids. The water-based fluids (soluble oils and synthetic fluids) are prone to high levels of microbial contamination, and routine use of MWFs can result in the generation of respirable aerosols (3). Exposure to MWF aerosols previously has been associated with cross-shift (i.e., during or after a work shift) decrements in airflow (a sign of reversible air-

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<sup>\*</sup>Available information was insufficient to characterize the PFT results for patient 4.

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way obstruction) and with cases of work-related asthma, although the precise pathophysiologic mechanisms for these associations remain unclear (4–6). HP-like illnesses associated with exposure to MWFs previously have been reported in the United Kingdom (7) and among U.S. automobile-manufacturing workers exposed to water-based MWF aerosols (8).<sup>†</sup>

The diagnosis of HP should be considered in persons with recurrent “pneumonia” or with recurrent or persistent episodes of unexplained respiratory and systemic symptoms<sup>§</sup>. Although no one factor has been identified that predicts clinical outcome, recurrent episodes of acute HP can lead to progressive, irreversible lung impairment. The primary treatment for HP is avoidance of continued antigen exposure. The severity of illness in the workers in this report, including the progression to respiratory failure in one case, emphasizes the importance of early recognition and treatment of this illness.

This report highlights the need for ongoing medical surveillance and exposure assessment for workers potentially exposed to MWFs to better characterize the suspected association between occupational exposure to MWFs and HP. The ongoing investigation of these cases includes further assessment of occupational exposures to MWFs, the nature of the inhaled antigens in workplaces in which MWFs are used, and the prevalence and natural history of HP in workers exposed to MWF aerosols.

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<sup>†</sup>These workers were diagnosed with HP based on a combination of work-related symptoms, chest radiographic findings, and lung-function studies; none underwent lung biopsy to confirm the diagnosis.

<sup>§</sup>When sufficient clinical criteria for a definitive diagnosis of HP are lacking, lung biopsy may be indicated (9,10); in addition, because transbronchial biopsy may sample unrepresentative areas of the lung, thoracoscopic or open-lung biopsy may be required.

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## Blastomycosis — Wisconsin, 1986–1995

Blastomycosis is a disease of humans and animals caused by inhalation of airborne spores from *Blastomyces dermatitidis*, a dimorphic fungus found in soil. The spectrum of clinical manifestations of blastomycosis includes acute pulmonary disease, subacute and chronic pulmonary disease (most common presentations), and disseminated extrapulmonary disease (cutaneous manifestations are most common, followed by involvement of the bone, the genitourinary tract, and central nervous system) (1). Although the disease is not nationally notifiable, it was designated a reportable condition in Wisconsin in 1984 following two large outbreaks. This report summarizes information about cases of blastomycosis reported in Wisconsin during 1986–1995 and highlights the importance of surveillance for blastomycosis in areas with endemic disease.

In Wisconsin, cases of blastomycosis are reported to the Division of Health (DOH), Wisconsin Department of Health and Social Services. A confirmed case is defined as isolation of *B. dermatitidis* or visualization of characteristic broad-based budding yeast from a clinical specimen obtained from a person with clinically compatible illness (e.g., subacute pneumonia or characteristic skin lesions).

During 1986–1995, a total of 670 cases of blastomycosis were reported to DOH, representing a statewide mean annual incidence rate of 1.4 cases per 100,000 persons. Of these, 636 (95%) were confirmed. Twenty-five (3.7%) cases were associated with two outbreaks that occurred in 1990 and 1993, with 10 and 15 reported cases, respectively. The median age of all case-patients was 46 years (range: 4 months–95 years); most cases occurred among males (60%) and among adults aged 25–44 years (40%). The mean annual incidence was higher for males than females in all age-groups; the group-specific rate was highest for males aged 45–64 years (2.5 cases per 100,000 population). Of the total reported cases, 29 were fatal (case-fatality rate: 4.3%), and case-fatality rates increased with age ( $\leq 11$  years, 0; 12–24 years, 1.6%; 25–44 years, 1.8%; 45–64 years, 3.4%; and  $\geq 65$  years, 12.5%). The number of reported cases was similar by month.

Supplemental clinical data were obtained for 378 (72%) of the 522 case-patients with onset during 1989–1995: a total of 287 (76%) had primary pulmonary disease without extrapulmonary manifestations, 68 (18%) had extrapulmonary infection without recognized pulmonary manifestations, and 23 (6%) had both pulmonary and extrapulmonary manifestations. Manifestations among persons with pulmonary disease