*Project S.E.N.S.O.R. News

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Hypersensitivity Pneumonitis

The presentation of hypersensitivity pneumonitis (HP), which is a difficult disease to diagnose, can be easily confused with other respiratory conditions such as asthma, pneumonia or sarcoidosis. Over this past year, there has been an outbreak of individuals diagnosed with HP from exposure to metal-working fluids (coolants) at three factories that machine metal parts. There was a more extensive outbreak of HP from exposure to metal-working fluids in factories machining metal in the Detroit/Flint metropolitan area in the early 1990's. Are these outbreaks truly increases in the incidence of HP or do they represent physicians becoming refamiliarlized with the condition and diagnosing HP that otherwise gets misdiagnosed?

HP (synonym extrinsic allergic alveolitis) is an immunologically mediated disease from inhalation of nondigestible antigens, that act as adjuvants, fix complement and initiate a cell mediated process.

HP was first described in farmers in the late 1800's (Farmer's Lung Disease) and there are now approximately 50 known types with descriptive names such as Mushroom Worker's Disease, Hot Tub Lung, Sauna Taker's Disease, etc. The article that described HP among individuals working with metal-working fluids named the disease Machine Operator's Lung (1). Typically, the cause of HP is a microbial agent, but in Pigeon Breeder's Disease it is a protein in the feather and certain chemicals, such as TDI (toluene diisocyanate), can cause both asthma and HP.

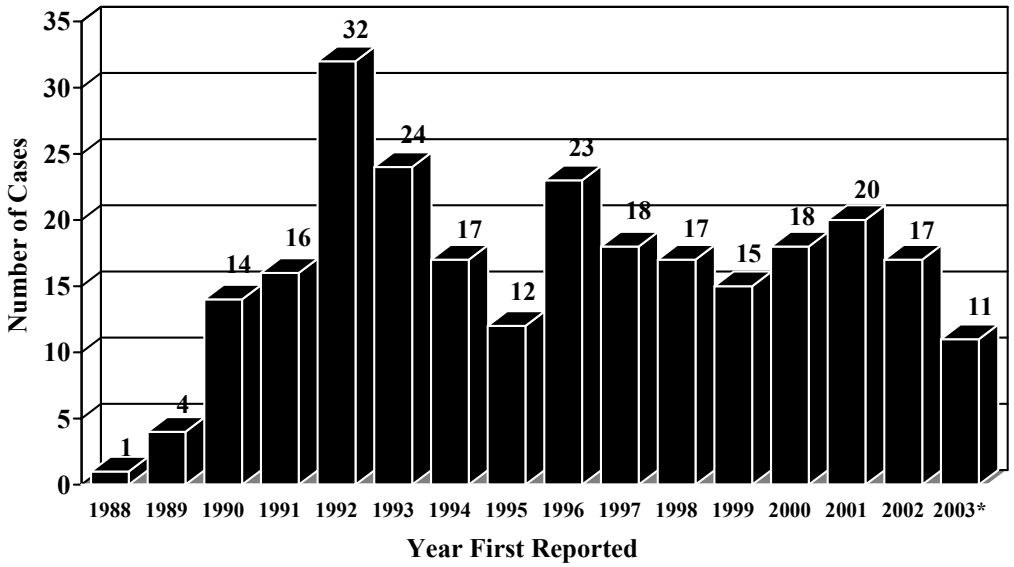
Table I shows a summary of the agents described in the outbreaks of Machine Operator's Lung recognized in the early 1990's (2). The most frequently recognized agent was mycobacteria chelonae, although not at all facilities and when antibody testing was performed antibodies were not necessarily found to this microbial agent.

Metal-working fluids are the second most common cause of work-related asthma reported in Michigan. An additive such as ethanolamine, not a microbial agent, is the presumed antigen for the asthma cases. Although the number of reports of work-related asthma from metal-working fluid peaked in 1992, the number of asthma cases related to metal-working fluid continue to be reported (Figure 1). As can be seen in the data from one plant with an outbreak of HP. Both HP and asthma cases were reported among the workers from exposure to metal-working fluids (Figure 2). This could be because of diagnostic confusion or occurrence of both conditions in the workforce. Twenty to forty percent of patients with HP have been described as having airway

Table I. Outbreaks of Hypersensitivity Pneumonitis in 8 Facilities Using Metal-Working Fluids, 1991-1995

Plant	Cases HP	Organisms in MWF	Serological Testing
1	6	M. Chelonae	Pseudomonas, Rhodococcus, Aspergillus niger, Staphyloccus capitas, Bacillas pumilus
2	3	—	Faeni rectivirgula, Fusarium
3	2	M. Chelonae	—
4	34	M. Chelonae	—
5	13	M. Chelonae	M. Chelonae, Aspergillus fumigatus, Aureobasidium pullulans, Themoactinomyces vulgaris, Faeni rectivirgula
6	10	Deleya Aesta	—
7	13	Pseudomonas pseudoalcaligenes, Ochrobacterum anthropi	—
8	14	Pseudomonas, Bacillus (gram ⊕), Fungi	—

Figure 1. Confirmed Cases of Work-Related Asthma Exposed to Metal-Working Fluids: 1988-2003



*Year 2003 data is not final as of 10-6-2004.

hyperreactivity and 5-10% go on to develop asthma.

Acutely, HP presents with flu-like symptoms, fever and radiological infiltrates that may suggest pneumonia. Typically, HP is not recognized unless there is a cluster of patients from the same facility presenting to the same health care provider or recurrent "pneumonia" in a healthy individual. HP is increased in nonsmokers and "the presence of active smoking is substantial evidence against the diagnosis of HP"(3). Ground glass appearance infiltrates on high-resolution CT scan of the chest is a common diagnostic finding of HP.

After subacute or chronic exposure, the patient can present with persistent shortness of breath and interstitial fibrosis on radiographic finding. The disease then can be confused with idiopathic fibrosis or sarcoidosis. On biopsy, characteristics that distinguish HP from sarcoid are shown in Table II (4).

Table II. Pathology Differences Between HP and Sarcoidosis

Findings that suggest HP:

- Alveolitis
- Bronchiolitis obliterans (50%)
- Granulomata less well formed and more centrilobular
- Cellular infiltrates containing lymphs, plasma cells and eosinophils

Table III shows the recent cases of HP reported from three facilities in southwest Michigan. These were generally long

Figure 2. Number of Individuals with Hypersensitivity Pneumonitis and Work-Related Asthma Reported to the State of Michigan, 1991-1996

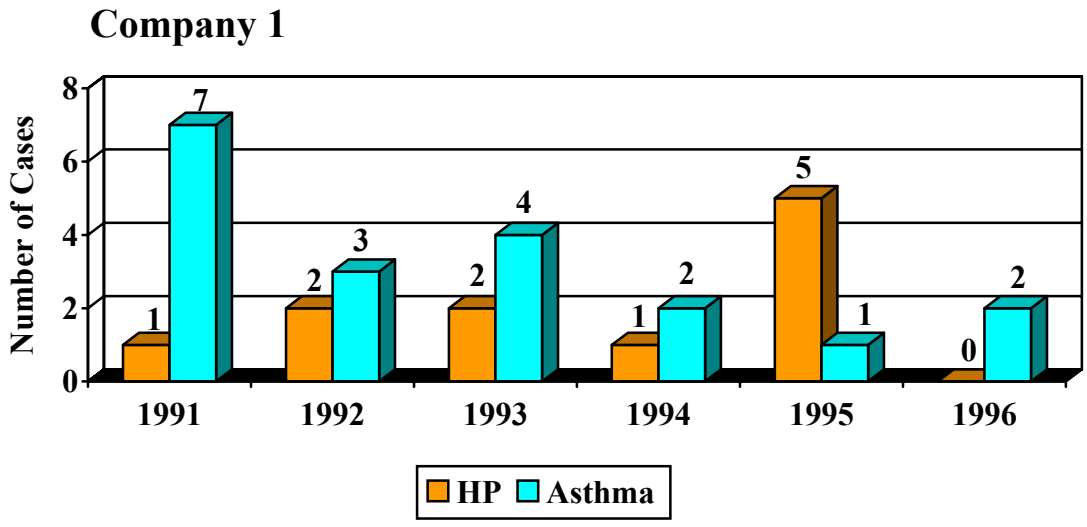


Table III. Hypersensitivity Outbreak, Southwest Michigan 2003/2004

	Length of Exposure (years)	PFTs	Smoking	Radiograph	Biopsy	Current Status
Company A						
1. Woman 50's	7	Restriction abn D_LCO Hyperreactive	Ex	Ground-glass	ND	Normal 4 months after removal
2. Man 40's	9	Restriction	N	Ground-glass	ND	Normal 1 month after removal
Company B						
1. Man 40's	27	Restriction abn D_LCO Hyperreactive	N	Ground-glass	ND	Symptomatic "Non-exposed" area
2. Man 50's	14	Restriction abn D_LCO	N	Ground-glass	HP	Symptomatic 2 months after removal
3. Man 40's	3	?	N	?	HP	Improved Still symptomatic 2 months after removal
4. Man 50's	3	Restriction abn D_LCO	N	Ground-glass	UIP	Normal 6 months after removal
Company C						
1. Man 30's	7.5	Restriction nml D_LCO	N	Ground-glass	HP	Asymptomatic 3 months after removal

term workers, nonsmokers, had restriction and abnormal diffusing capacity on pulmonary function testing, ground-glass appearance of infiltrates on CT scan, who became asymptomatic and their chest radiography and pulmonary function tests returned to normal after removal from exposure. Although one lung biopsy of one patient was interpreted as usual instertial pneumonitis (UIP) not HP, the patient did not show the progressive disease typically of UIP.

There is a commercially available hypersensitivity panel that measures the presence of IgG antibodies in patients' serum to 6-8 standard antigens associated with HP. If positive it is useful marker of exposure but does not indicate HP in the absence of clinical disease. Unfortunately, most of the time the commercially available HP panel is negative since the microbial organism which is the antigen in the metal-working fluid causing disease is not present in the commercially available laboratory panel. With more effort and expense, one can collect environmental samples from the facility, culture these environmental samples and look for IgG antibodies in the patients' serum to organisms cultured from the actual environmental samples to which the patient is exposed.

The key to treatment is removal from exposure. Individuals will get better quicker with oral steroids, but use of steroids does not stop the development of interstitial fibrosis associated with continued exposure.

We are very interested in any reports of *known* or *suspected* HP and can assist in arranging for testing of IgG specific antibodies to potential antigens that your patient is exposed. Please call Dr. Kenneth Rosenman at 1-800-446-7805 if you have patients with possible HP that you wish to discuss or need assistance determining the antigen. Please report any cases via our toll-free number, email, fax, mail, or internet (see page 4 for reporting information).

References

1. Bernstein DI, Lummus ZL, Santilli G, Sigkosky J, Bernstein IL. Machine Operator's Lung. A Hypersensitivity Pneumonitis Disorder Associated with Exposure to Metal-Working Fluid Aerosols. Chest 1995;108:636-641.
2. Kreiss K, Cox-Ganser J. Metal-Working Associated Hypersensitivity Pneumonitis: A Workshop Summary. Am J Ind Med 1997;32:423-432.
3. Schuyler M. Hypersensitivity Pneumonitis in Fishman's Pulmonary Diseases and Disorders, 3rd Edition. Eds. Fishman AP, Elias JA, Fishman JA, Grippi MA, Kaiser LR, Senior RM. New York: McGraw Hill.1998;1085-1097.
4. Forst LS, Abraham J. Hypersensitivity Pneumonitis Presenting as Sarcoidosis. Brit J Ind Med 1993;50:497-500.

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Address service requested.

In this issue:

*PS *Remember to report all cases of occupational disease!*

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