Metal Working Fluids and Lung Disease

Cases of respiratory disease caused by exposure to metal working fluids (MWFs) peaked in the 1990’s after hypersensitivity pneumonitis (HP) from exposure to MWFs was first described in workers from an auto parts manufacturer in Southfield, Michigan (1). Subsequent to that initial report, multiple outbreaks of HP were described in other auto parts facilities in Michigan, Ohio and Wisconsin, and then in England and France (2-4). During these outbreaks of HP, cases of work-related asthma (WRA) were also identified. Figure 1 shows the distribution of cases of both HP and WRA recognized at a single facility in Michigan from 1991-1996.

Since 1988 there have been a total of 319 cases of WRA caused by exposure to MWFs reported in Michigan. Most cases were reported in the 1990’s and early 2000’s.

For 1988 through 2013 inclusive, MWFs were the 3rd most common cause (9.8%) of WRA in the state (Figure 2). However, there has been a marked decline over this time period in the number of reported cases.

**CASE REPORT**

A male in his 30’s developed wheezing, a productive cough, chest tightness and shortness of breath one year after beginning to operate a grinding machine at an auto parts manufacturer. His symptoms improved when he was away from work, particularly on vacations. He was prescribed Advair and ProAir. He had never smoked cigarettes and had no personal or family history of allergies. He continued to be exposed to a soy-based MWF. During a Michigan OSHA inspection of the facility, half of the workers doing machining were bothered at work by daily or weekly shortness of breath, chest tightness or wheezing. The air levels for MWFs were within the Michigan OSHA permissible exposure limit. OSHA made recommendations to improve ventilation and provide regular medical screening, given the high percentage of symptomatic workers.

**WHAT ARE METAL WORKING FLUIDS?**

Metal working fluids are liquids used to reduce heat and friction and remove small metal particles during the machining (i.e. cutting, drilling, grinding and milling) of metal parts. Metal machining is a common activity in the manufacture of automotive and truck parts, as well as other types of machinery.
WRA cases caused by MWFs. We now receive two to four case reports a year, compared to 10-20 reports received each year from 1990-2005, with a peak of 32 in 1992 (Figure 2). WRA caused by MWFs now represents about 5% vs. over 10% of reports received from 1990-2005 (Figure 3). The decrease in WRA cases from MWFs is steeper than the decline in the overall number of WRA cases reported during this same time period (88% vs. 57%).

This decline in reports received in Michigan parallels the decrease in reports in the medical literature of HP from MWFs (5) and the decrease in WRA cases reported to the Shield surveillance system in the English West Midlands (6).

What is the reason for the decrease in reports of WRA and HP from exposure to MWFs? No changes have been made in the allowable OSHA air standard of 5 mg/m³, which dates back to 1972, although in 1998 NIOSH recommended the standard be decreased to 0.5 mg/m³. The 5 mg/m³ level was not selected for health reasons but because at levels above 5 mg/m³ MWFs in the air create unsafe work conditions when the fluids condense on factory ceilings, dripping down on work stations and factory floors. Although OSHA did not promulgate a new standard, in 1999 OSHA developed a best practices guide for using metal working fluids (7). The feasibility of retrofitting older equipment and reducing exposure has been demonstrated and most companies are reported to be using the 0.5 mg/m³ level after purchasing new equipment and a 1.0 mg/m³ level as their standard for older equipment (8). There has also been increased awareness about work practices and proper maintenance of MWFs. We presume that better control of exposure has been important in reducing the occurrence of respiratory disease among individuals working with metal working fluids, because the use of MWFs remains widespread.

**Causal Mechanism of MWF-related Lung Disease**

- **Work-Related Asthma** – Sensitization to the fluid or additives
- **Hypersensitivity Pneumonitis** – Immunological reaction to a microbiological contaminant

**Common Names Used for Metal Working Fluids**

- Coolants
- Cutting compounds, oils, or fluids
- Lubricants
- Metal removal fluids

*During forging and stamping processes, drawing or stamping compounds, which can have similar ingredients as MWFs, are used.*
We encourage practitioners who have patients with hypersensitivity pneumonitis or asthma and work in manufacturing facilities to consider metal working fluids as the potential causal agent. We are very interested in hearing from you if you have a known or suspected case. Please report via fax, email, our website or by calling Kenneth Rosenman, MD at 1-800-446-7805. Dr. Rosenman can also provide consultation on diagnosis and treatment issues.

References

6) http://www.occupationalasthma.com/occupational_asthma_pageview.aspx?id=493
In this issue: v26n1 Metal Working Fluids and Lung Disease

*PS Remember to report all cases of occupational disease!

Printed on recycled paper.