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

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In Memoriam

Terrorism took a large and horrifying toll on human lives this past year. Most of these deaths occurred among individuals at work; not only emergency responders but the office workers at the World Trade Center and the Pentagon, and airline personnel and business travelers on the planes. In a "normal" year, approximately 6,000 workers die in the United States from an acute work-related traumatic fatality. For the year 2001, the statistics on the number of work-related deaths increased by over 50%. We wish to remember all those who lost their life at work last year and dedicate increased efforts to prevent such tragedies from occurring in the future.

Asthma and Welding

Welding is a common activity that occurs across many different types of industry. Welding can occur on a regular basis in highly industrialized settings like an auto plant where robots perform over 1,000 welds per car or on a less frequent basis where a farmer is fixing a tractor. Welding is the union of metal at a joint by melting of the metal edges to be joined. Usually molten metal is added to the joint from a consumable electrode or a separate filler rod. In brazing and soldering a filler metal with a lower melting point than the metal being fused, is melted rather than the adjacent edges of the metal that is being joined.

The temperatures used to melt the metals create ultraviolet, visible and infrared electromagnetic radiation. From a respiratory perspective the problem is that the temperatures liberate vapors that include both metals and combustion products. These fumes come from the metals being welded, chemical fluxes that may be used to prevent oxidation and facilitate joining and coatings or degreasing agents that may not have been properly removed from the metal before beginning to weld.

The respiratory risk depends on the rate at which fumes are generated and the amount of ventilation in the welding area. Certain types of welding produce higher fume rates than others. Flux covered arc welding produces higher fume rates than shielded metal and gas metal arc welding which produce higher rates than gas tungsten arc welding.

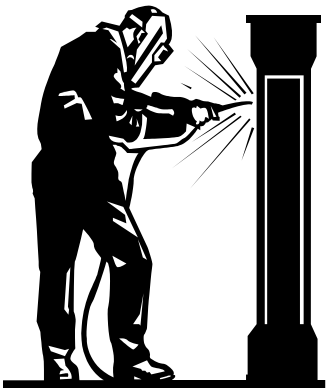
Welding stainless steel which produces fumes containing chromium and nickel has generally been considered to be a higher risk procedure for developing work-related asthma than welding mild steel which produces fumes containing aluminum, magnesium iron, titanium and trace amounts of cobalt, zinc and lead (Keskinen et al, 1980; Sobaszek et al, 2000). However,

welding on mild steel has also been reported to cause work-related asthma (Beach et al 1996; Vandenplas et al, 1995) and one study has reported a similar incidence of asthma in workers welding on the two different types of metal (Wang et al, 1994). This lack of difference in risk of work-related asthma between different types of welding may be because asthma that develops from welding may not be secondary to a specific metal components but rather secondary to the irritants in the welding fumes (Contreras and Chan-Yeung, 1997).

The most important toxic gases generated during welding are ozone, oxides of nitrogen, carbon monoxide and phosgene. Ozone, oxides of nitrogen and phosgene are all irritants. High exposures will cause pulmonary edema. The long term sequelae after recovery from pulmonary edema caused by oxides of nitrogen is bronchcolitis obliterans.

Welding metal coated with zinc (galvanized metal) releases zinc oxide which can cause work-related asthma (Langley, 1991, Malo and Cartier, 1987). Asthma from exposure to zinc oxide fumes needs to be distinguished from the more common condition; metal fume fever, which is a flu-like illness that occurs within hours after exposure and clears within 24-48 hours although it has been reported to last up to five days. Unlike sensitization to zinc, metal fume fever occurs in previously unexposed individuals or in someone who has not been recently exposed. Those individuals who are repeatedly exposed to zinc oxide became tolerant and no longer experience the symptoms (Fine et al, 2000).

Welding is among the ten most common causes of work-related asthma in Michigan, causing asthma in approximately 5% of the reported cases. Eighty-two individuals have been reported with asthma from welding. Eight were from aggravation of pre-existing asthma and the other seventy-four reports were on individuals with new onset asthma. One of the individuals with new onset asthma developed asthma after a single high exposure (RADS) while the seventy-three others developed their asthma after repeated exposure to welding fumes. Fifty-one of the individuals had worked in auto manufacture, eleven in metal fabrication, six in industrial and commercial machine manufacture, and one in construction. The other ten individuals had worked in many different types of industries.



Two case reports follow:

Case A

A man in his 20's developed chest tightness, shortness of breath and wheezing two years after beginning to weld at a company that built dies for auto manufacturing. His symptoms were worse at work. He had never smoked cigarettes and there was no personal or family history of allergies. He was given Flovent, Accolate and a home nebulizer with a bronchodilator. He was seen in the emergency room eighteen times and received numerous short courses of prednisone. He left work on his doctor's advice one year after his symptoms began. His symptoms remained, but lessened. He has continued to use Flovent and a home nebulizer with a bronchodilator. Spirometry was normal with a FVC of 5.39 liters (96% of predicted), FEV_1 of 4.31 liters (96% of predicted) and FEV_1/FVC ratio of 80% (96% of predicted). He had a positive methacholine challenge test (28% drop in FEV_1) reacting to the 3rd dose of methacholine.

Case B

A woman in her early 60's presented to her doctors with symptoms of chest tightness, cough, shortness of breath and wheezing which were worse at work. These symptoms began

nine months after beginning to take parts from welders and assembling them into car seat frames. She had been with the company approximately ten years before being transferred to this new job. She was begun on Singulair and Albuterol. On her doctor's advice, she left work approximately two months after her symptoms began. Subsequently, her symptoms decreased. She had never smoked cigarettes and had no personal or family history of allergies. She never was treated in the emergency room or hospital for asthma. Her baseline spirometry was abnormal and showed an FVC of 2.18 liters (81% of predicted), FEV_1 of 1.54 liters (70% of predicted), and a FEV_1/FVC ratio of 71% (86% of predicted). With a bronchodilator her FEV_1 increased to 1.74 liters, a 13% improvement.

The Michigan OSHA program will shortly begin a new initiative to evaluate worker exposure to welding fumes. We are interested in hearing from you about any patients you have who you suspect may have their asthma caused or aggravated by welding fumes. Please call our toll-free number, 1-800-446-7805, or e-mail us at ODReport@msu.edu.

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In this issue:
Asthma and Welding

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

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