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## Polymer-Fume Fever Associated with Cigarette Smoking and the Use of Tetrafluoroethylene -- Mississippi

Three of the five workers at a Mississippi shop that produces plastic signs and rubber and metal stamps had several episodes of severe "flu-like" symptoms between July 1985 and March 1986. The symptoms were of unknown origin and usually subsided within a day. Only the employees making stamps were affected. In response to a request by the company's owner, the National Institute for Occupational Safety and Health (NIOSH) sent a medical officer and an industrial hygienist to investigate on March 4, 1986.

The investigators observed work processes, reviewed material safety data sheets to determine the composition of materials being used, and recorded the affected employees' medical histories. They also collected ambient air samples to test for various solvents and metal fumes. These tests showed no detectable levels of trace metals and only trace (microgram) amounts of xylene, toluene, methyl chloroform, and hexane, all of which were well below the respective exposure levels recommended by NIOSH.

The investigators learned, however, that there had been a change in the stamp-making process during the summer of 1985. Prior to that time, a phenolic mold board had been used during production of rubber stamps and notary seals. In early July 1985, the company's supplier had switched to an asbestos-free board. In making the stamps, a die is heat-pressed into the board in a small oven at 152 C (305 F) for about 20 minutes. The die is then used to mold a rubber sheet into the stamp's image. Because this new composition board did not release the rubber sheet properly, a mold-release spray was used.

The material safety data sheet for the mold-release spray indicated the presence of a small amount (less than 1%) of tetrafluoroethylene, a fluorocarbon monomer. It also warned that fluorocarbon propellants could pose a public health problem by reducing ozone in the upper atmosphere and that excessive heating might burst the container. The supplier failed to state that the products of decomposition of fluorocarbon monomers and polymers can produce a condition known as "polymer-fume fever" and that cigarette smoking is the most common means of creating exposure

to these products.

The first worker to become ill began experiencing symptoms one evening after work during the last week of July 1985. He had a lower backache followed, after 30 to 45 minutes, by intense rigors, nocturnal fever, chills, malaise, and a more intense backache. He also experienced a dry, nonproductive cough. By morning, he felt much better. The same pattern of symptoms occurred two or three times during the week, but not on the weekend. The other two workers experienced similar symptoms, with extraordinary chills and occasional fever. For these workers, too, the symptoms subsided by morning. All three employees ate, drank, and smoked in the vicinity of the heat-pressing oven.

The investigators recommended a ban on smoking or even carrying tobacco products in the work area as well as more effective ventilation and improved sanitation procedures, such as hand washing. The company's owner immediately implemented these recommendations, and the workers have been free from symptoms since that time. The distributor of the mold-release spray was informed of this potential hazard and agreed to place a warning on the label.

The investigators concluded that the employees' symptoms were indicative of polymer-fume fever because they were similar to the classical features of the condition (1) and because 1) no symptoms occurred before the introduction of the mold-release spray containing fluorocarbon, 2) only the workers using this product experienced symptoms, 3) all three affected employees smoked in the area where the compound was used, 4) symptoms subsided by morning and did not occur on weekends, and 5) symptoms resolved after the new safety recommendations were implemented. Reported by: Div of Surveillance, Hazard Evaluations, and Field Studies, National Institute for Occupational Safety and Health, CDC. Editorial Note: Mold-release agents have been previously implicated as a cause of polymer-fume fever (1). An estimated 282,000 workers in the United States are potentially exposed to such compounds (2). Fluorocarbons may be deposited on cigarettes from the air or from workers' fingers. As a cigarette is smoked, fluorocarbons are then burned or "pyrolyzed", and the products of decomposition are inhaled with the cigarette smoke. The actual products of decomposition may vary and are dependent on which polymers were used and at what temperature and humidity they were burned. The most common known products of pyrolysis include inorganic fluorides, hydrogen fluoride, carbonyl fluoride, and perfluoropropane (3).

Manifestations of polymer-fume fever comprise chest tightness, a choking sensation, dry cough, fever, chills, and pains in the joints. Symptoms begin several hours after exposure and resolve within a day or two (4,5). Little information is available on the health effects of chronic exposure to the fluorocarbon produced when polytetrafluoroethylene is decomposed. There is, however, at least one case report of otherwise unexplained diffuse interstitial pulmonary fibrosis following multiple episodes of polymer-fume fever (6).

The following recommendations are made to help protect employees who must work with fluorocarbons:

1. List the presence of all fluorocarbons on container labels.
2. Strictly enforce a no-smoking rule in all areas where fluorocarbons are used.
3. Prohibit the presence of all tobacco products in areas where fluorocarbons are used since a

spray or mist could disperse and contaminate these products.

4. Observe general sanitation procedures such as frequent handwashing, particularly after handling materials containing fluorocarbons and always before eating, smoking, or handling tobacco products.
5. Install and maintain local exhaust ventilation as close as possible to areas where high temperatures are used. A tight hood and duct design can effectively control airborne contaminants. Polymer-fume fever should be considered in the diagnostic evaluation of any occupationally related fever of short duration and unknown origin (7).

## References

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