



Statement of

Dr. Philip J. Landrigan, Director
Division of Surveillance, Hazard Evaluations and Field Studies
National Institute for Occupational Safety and Health
Center for Disease Control
Department of Health, Education, and Welfare

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My name is Dr. Philip J. Landrigan. I am a physician, a specialist in occupational medicine, and Director of the Division of Surveillance, Hazard Evaluations and Field Studies of the National Institute for Occupational Safety and Health (NIOSH). NIOSH is responsible for conducting research, developing recommended occupational safety and health standards, providing technical assistance to employees and employers, and conducting training and education programs. NIOSH has similar responsibilities to protect the health of miners under the Mine Safety and Health Act of 1977. I am pleased to have been invited to discuss some of the occupational hazards which confront workers employed in the jewelry industry.

As you know, southern New England has an enormous concentration of the jewelry manufacturing industry. According to NIOSH files, which are based on the Dun and Bradstreet Market Identifier File, Rhode Island alone has some 815 jewelry manufacturing establishments which employ over 31,000 workers. The costume jewelry industry is especially heavily represented, and nearly half (13,437 of 30,819) of the costume jewelry workers in the nation are employed in Rhode Island.

The jewelry industry in New England is an industry of small shops. Of the 815 jewelry manufacturing establishments in Rhode Island, 324 (40%) have fewer than 10 employees and another 411 (50%) have between 10 and 100 workers. Only 60 of the plants in the state have from 100 to 500 employees and only 10 employ more than 500 workers. That information has important implications for the health of workers in the jewelry industry. It has been shown repeatedly in NIOSH studies, and in

those of other investigators, that workers in small plants are often at greater risk of toxic occupational exposure and are at greater risk of suffering occupationally-related illness and injury than are workers in larger plants. They are certainly less likely to be under adequate medical surveillance.

Workers in the jewelry industry may be exposed to a wide variety of toxic substances, including organic solvents, metal fumes, acid mists, and asbestos. Jewelry workers may, in addition, be heavily exposed to noise and may be at high risk of physical injury, including amputation, as the result of working with improperly guarded machine tools and power presses. I would like to characterize the hazards faced by jewelry workers by describing in some detail the health effects of several substances used in the industry.

The solvent 1,1,1-trichloroethane (also known as methyl chloroform) has come into increasing use in recent years as a degreasing or metal cleaning agent in the jewelry industry. Pieces of jewelry to be cleaned are dipped into open tanks of this solvent or are suspended in containers of trichloroethane vapor. Trichloroethane is a volatile substance, and in the absence of proper exhaust ventilation the exposure of workers to chloroethane vapor can be intense.

Among the most harmful effects of trichloroethane exposure are those on the central nervous system. The chemical acts as a central nervous system depressant and at high doses has anesthetic properties. The neurologic symptoms commonly seen at lower doses of trichloroethane

exposure include dizziness, nausea, vomiting, slowed reaction time, and reduced manual dexterity.

Trichloroethane also has harmful effects on the circulatory system. Exposure to trichloroethane in animals produces a rapid drop in the blood pressure and a change in the heart rate. Continued exposure to high concentrations of trichloroethane has been noted to damage the heart muscle and produce circulatory problems resulting in lung congestion. There have been occasional reports of serious cardiac arrhythmias (disturbances in the heart rhythm) in workers exposed to trichloroethane.

To protect workers against the harmful effects of trichloroethane NIOSH has recommended that exposure to airborne vapors not exceed 350 parts per million (ppm) in any 15-minute period. NIOSH also has published a comprehensive list of recommendations for the proper ventilation of workshops in which trichloroethane is used and for the medical supervision of exposed workers. These recommendations are included in the NIOSH "Criteria For a Recommended Standard on Occupational Exposure to 1,1,1-Trichloroethane," published in July 1976, which is available from NIOSH and from the Government Printing Office.

Exposure to metal fumes is another occupational hazard in the jewelry industry. Fumes of zinc or copper liberated during soldering or metal pouring can cause an illness called "metal fume fever." In this condition a worker experiences chills, fever, and often chest pain and breathing difficulty. The onset of symptoms is often delayed for 8 to 12 hours after exposure and thus frequently occurs during the nighttime

hours. When the worker is examined he often has a low-grade fever and an elevated white blood cell count. Although the acute illness subsides spontaneously after a few hours, or at most in a day or two, repeated episodes of metal fume fever may cause permanent lung injury.

Exposure to the lead fumes may occur in jewelry manufacture, which can cause the full spectrum of lead poisoning, including abdominal cramps, tremor, anemia, neurologic damage, and in severe cases, chronic kidney disease.

Cadmium is another hazard faced by some jewelry workers. It is a toxic metal used frequently in soldering, particularly in silver jewelry. Acute exposure to cadmium fumes can cause intense irritation of the eyes, nose, and respiratory tract, while chronic exposure may lead to lung and kidney damage and occasionally to lung cancer.

Several years ago I was asked to investigate an epidemic of unusual illness in a small jewelry factory in which the prominent symptoms were fatigue, nasal congestion, cough, and chest pain. One or more of the symptoms was experienced by 27 (75%) of the 36 workers in the plant. All of the workers with these symptoms were soldering workers. We learned that the symptoms began appearing several months earlier shortly after a new soldering material, labeled simply "silver brazing compound," had been introduced into the plant process. In the course of our investigation we found that the so-called "silver brazing compound" was in fact an alloy which contained 15% cadmium, and that when this alloy was heated, toxic concentrations of cadmium were liberated into the workroom air where ventilation was quite inadequate. We also found

increased concentrations of cadmium in the blood and urine of the exposed workers. One year later, following removal of the cadmium soldering compound from the plant, we found that symptoms had disappeared in most of the ill employees. This episode illustrates not only the hazards of exposure to cadmium fumes, but also demonstrates the dangers inherent in the widespread industrial practice of inadequate product labeling.

The effects of exposure to trichloroethane and metal fumes are often reversible. If the exposure is eliminated, the worker's health can generally be restored. However, some substances to which jewelry workers are exposed may cause irreversible damage. Asbestos, my final example today, is such a substance.

Asbestos boards are used in many jewelry shops to provide a heat-resistant surface for soldering and metal pouring. Asbestos fibers are used as an abrasive in sanding and polishing operations. In many of those operations, asbestos fibers can be liberated into workplace air. If inhaled by workers, these fibers can lodge in the lungs where they may produce serious and irreversible injury. Lung damage caused by asbestos includes asbestosis, a chronic debilitating lung disease in which the normal elastic tissue of the lung is replaced by inelastic scar tissue. Other diseases caused by asbestos exposure are cancer and mesothelioma, a rapidly fatal tumor of the external lining of the lungs.

It is clear that jewelry workers can be exposed to a number of toxic substances which can seriously affect their health. It is the employer's responsibility to assure that exposures do not exceed current

OSHA standards. Both employers and employees need to know what substances are being used, as well as symptoms of overexposure, safe handling procedures, emergency care and proper disposal methods.

Any employer or employee representative who suspects that workers are getting sick as a result of workplace exposures can request a health hazard evaluation from NIOSH. NIOSH will send out a team of occupational health specialists to determine whether workers are exposed to harmful levels of toxic substances and conduct medical examinations if necessary. NIOSH also generally makes specific recommendations for engineering controls and work practices to assure that employees are protected from hazardous exposures.

In the jewelry industry we recommend that operations involving cleaning, painting, glueing, soldering, brazing, plating and grinding have local ventilation so that toxins are carried away from workers. Workers using toxic chemicals, such as cleaning compounds, should not only avoid inhalation, but should also wear impervious clothing, including gloves, boots, aprons, and eyewear that will protect against splashes. Chemicals should be labeled and information on potential health hazards be readily available. Chemicals must be stored and mixed in ways that eliminate the hazards of explosion or formation of highly toxic compounds. Work areas should be separate from eating areas and rest rooms, and workers should remove their protective clothing and wash their hands when leaving the work area. By keeping employee exposures to a minimum through adequate engineering controls and good work

practices, employers can help assure that jewelry workers are not harmed by the potentially dangerous chemicals used in the industry.

Mr. Chairman, I will be pleased to try to answer any questions you may have.

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16. Abstract (Limit: 200 words) - This testimony concerned the efforts of (NIOSH) in making the jewelry industry a safe occupation for workers. Heavy emphasis has been placed in the southern New England area as there was an enormous concentration of the jewelry manufacturing industry in that region. It has been an industry of small shops. Workers in small shops have been at a greater risk than those in larger operations where more corporate attention is given to their safety. Workers in the jewelry industry were exposed to a wide variety of toxic substances including organic solvents, metal fumes, acid mists, and asbestos (1332214). They may also be exposed to noise and may be at high risk of physical injury including amputation as the result of working with improperly guarded machine tools and power presses. Among the most harmful effects of the commonly used solvents were damage to the central nervous system and harmful effects on the circulatory system. Exposure to metal fumes can result in metal fume fever. Lead (7439921) fumes may cause lead poisoning. Exposure to the other metals can result in irritation of the eyes, nose and respiratory tract along with lung cancer.

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