

Ill Effects of Theatrical Special Effects

Smoke—and Fog, Mist, and Haze—May Be Hazardous to Your Health

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One actor's dramatic complaint was quoted in the *New York Post* of October 17, 1985. Dom DeLuise described a scene being shot for NBC Television as being full of "smoke and clouds and things There was so much carbon dioxide in the air we were falling over each other. In fact three people had to go to the hospital."

Everyone is familiar with the smoke, fog, haze, mist, and other pyrotechnics of modern movies and television shows. For over 40 years, various compounds and mixtures have been vaporized, sublimed, sprayed, and burned to create these special effects on stages and sets. Unfortunately, some of the techniques that produce these effects can be detrimental to the health of those exposed to them.

Although there have been no formal studies of the damage done by artificial smokes and fogs, the Center for Occupational Hazards, a national clearinghouse for research and education on the hazards of art and theater materials, and major theatrical unions have repeatedly received complaints about them from performers and technicians. Some union contracts now include provisions for limiting the exposure to fog and smoke. In addition, an industrywide Labor Management Safety Committee convened by the Alliance of Motion Picture and Television Producers published the "Smoke Inhalation Guidelines" (Bulletin No. 10, December 1, 1983). These guidelines include standards for minimizing theatrical smoke and fog, ventilating interior areas, giving personnel breaks to reduce exposure, and providing respirators.

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Symptoms of exposure to theatrical fogs and smokes include dry or irritated eyes, nose, and throat, dizziness, headache, upper respiratory tract congestion, coughing, blurred vision, and nausea. Occasionally an affected individual will fail to make the connection between these symptoms and the exposure, either because an employer has said that the fog or smoke is safe or because the symptoms are the same as those of other illnesses. Even more often, performers or technicians will not mention the special effects hazards for fear of losing their jobs if they complain or appear unhealthy. Physicians

may need to solicit information about the use of special effects on stage when these patients have such symptoms.

Exposure to these smoke and fog chemicals is not limited to professional actors and technicians. Theatrical productions from Broadway to public schools, discos and nightclubs, and amusement and theme parks also employ these products with increasing frequency.

Fog and Smoke Chemicals

Many chemicals far more hazardous than the carbon dioxide mentioned by Dom DeLuise also are present in theatrical smokes and fogs. It is becoming increasingly difficult to keep informed about them because "new and improved" products are continually appearing on the market. In general, however, fog and smoke products create their effects by:



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1. Vaporizing or misting organic chemicals such as petroleum distillates and fuel oil, which may cause narcosis, eye and lung irritation (even pulmonary edema with heavy exposure), and other systemic problems if exposure is significant. In vapor form they are also fire hazards. Other safer products should be substituted for them.

2. Misting mixtures of water and organic chemicals such as glycerine, mineral oils, ethylene glycol, diethylene glycol, and propylene glycol. Most of these substances also can cause narcosis and mucous membrane irritation. Many have been poorly studied for systemic or long-term effects. Ethylene and diethylene glycol, which are commonly found in antifreeze and coolant products, may be toxic in the mist form, producing symptoms of narcosis on acute exposure. Chronic exposure is associated with kidney and liver damage.

3. Subliming dry ice. Dry ice is the safest material to use and is recommended for use except in conditions in which levels of carbon dioxide high enough to cause asphyxiation could be achieved.

4. Heating or fuming inorganic chlorides such as ammonium, zinc, or titanium chlorides. Of these, ammonium chloride is least irritating. Use of the other two more irritating chlorides should be discouraged.

5. Burning organic materials such as gums (e.g., frankincense), paper, or resins. All smokes are irritating and hazardous in high concentrations. People with respiratory problems and allergies may be at increased risk from these smokes.

The labels on most fog and smoke products will not list ingredients or will be overly reassuring.

Investigating Fog and Smoke Products

Physicians should have access to fog and smoke ingredients if their patients appear to be affected adversely by them. However, physicians should not rely solely on product labels for this purpose. The labels on most fog and smoke products will not list ingredients or will

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be overly reassuring. For example, some manufacturers label their products "nontoxic" because they pass *acute* animal tests, or because they assume that their customers are exposed to only small amounts on well-ventilated stages, and for short periods of time. Actually, mists and smoke thick enough to obscure vision may contain significant concentrations of chemicals, and they may be used in poorly ventilated studios for long periods (12-hour days are not uncommon during the filming of television commercials and videos).

In addition to checking labels, physicians may want to obtain Material Safety Data Sheets (MSDSs) and other ingredient information on these products. New laws such as the "right-to-know" laws passed by many states and the OSHA Hazard Communication Standard have made it easier to obtain MSDSs. However, very few fog and smoke product MSDSs are very informative. Some companies do not respond to requests for MSDSs, others send incomplete or inadequate MSDSs, and still others provide no ingredient information, claiming their products are proprietary.

In any case, MSDSs should be used primarily to obtain ingredient information and not to provide health hazard data. Although the new OSHA Hazard Communication Standard requires MSDSs to include chronic effects if known, most MSDSs list only the most rudimentary acute health effects.

When evaluating fog and smoke ingredients, physicians and health professionals should keep in mind certain principles:

1. Smoke and fog are *inhaled*, so the product's toxicity by this route of entry

should be considered primarily. For example, mineral oil is of very low toxicity when ingested, but when inhaled it can cause pulmonary edema and other lung problems. Ask manufacturers of "nontoxic" products how they have tested them.

2. Liquid and solid fog and smoke products may change chemically when they are fumed or misted. Some products are heated or burned. Others may be expelled through the heated nozzle of a special machine designed to create fog. Still others are aerosolized by pressurized gas. Information should be obtained about the product's toxicity when it is in its final form.

3. There are no threshold limit values or good chronic hazard data for many fog and smoke chemicals. Their long-term effects are often largely unknown.

4. Minor health effects that are not reported in acute animal tests could be very important in the theater. Rats, for example, cannot tell scientists that a substance gives them sore or dry throats. Yet a sore or dry throat could be a serious problem for a singer or actor.

5. Consider exposure of high-risk individuals such as children and people with lung or heart disorders. For example, the label on one product warns that people with asthma should not be heavily exposed to it. Yet no one medically screens actors and audiences prior to such exposure. In general, high-risk adults and child performers should be discouraged from working in fogs and smokes which have known adverse effects, which have OSHA Permissible Exposure Levels (PELs), or whose effects are unknown.

Information Source

The Center for Occupational Hazards (COH) has a good collection of MSDSs and product information about smokes, fogs, and other theater materials such as paints, plastics, and theatrical makeup. The Center is the only national clearinghouse for information about the hazards of theater, art, and craft materials. Write to COH, 5 Beekman Street, New York, NY 10038. When requesting information, please enclose a self-addressed stamped envelope.