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## Questions and Answers

*Handwritten signature: J. J. J. J.*

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### Hazards of Aerosol Hair Sprays and Antiperspirants

**Q** Present evidence implicates vinyl chloride gas in some cases of sarcoma of the liver. Since some of the hair sprays in common use contain vinyl resin that is, I believe, a compound derived from vinyl chloride, I am concerned about the hazards that may be associated with their daily use. Do these hair sprays really contain hazardous components? If so, what are they and what harm do they cause? Has there been a change in hair-spray composition since the Food and Drug Administration (FDA) became interested in these products? What hazards are associated with the use of antiperspirants and other types of aerosol preparations?

RAMON K. TAN, MD  
Buffalo, NY

*This question was referred to two consultants, whose discussions are as follows:*

**A** Currently available hair sprays in normal use do not contain hazardous components. Improper use (spraying into the eyes, spraying into a plastic bag and then placing one's head into the bag) can result in hazardous exposures. Similarly, under normal conditions of use, other types of personal aerosols (such as deodorants and feminine hygiene sprays) or household aerosols contain no hazardous components in presently available products. There is an Inter-Industry Aerosol Safety Subcommittee that has sponsored a series of studies on propellant systems and ingredients sprayed from aerosols. While there are a number of projects the subcommittee has yet to complete, the studies as of now are said to indicate that the aerosol "safety range" is tremendous in normal use.<sup>1</sup> However, the subcommittee is considering additional studies relative to particulate-matter distribution and retention by the respiratory system and the acute, subchronic, and chronic effects on the respiratory system of expelled aerosolized particulate matter.

One must, of course, differentiate between external aerosol sprays and the internal (throat) spray used for medicinal purposes; comments in the literature and public press do not always make adequate distinction between these two different types of sprays.

There have been a number of reports in the medical literature over the past 15 years on adverse reactions to some of the components of personal aerosols. These reports have resulted in large-scale tests sponsored by industry or by government to determine in a scientific study what the facts are. Thus far, all such controlled studies have identified no notable adverse reactions. This includes, I am told, a recently completed investigation spon-

sored by the FDA in Salt Lake City, where about 300 beauticians (that segment of the population most likely to be overexposed to hair-spray use) were studied. Results of this study are now being tabulated and probably will be published.

As a precautionary measure, prompted by the data generated by groups involved with occupational hazards, vinyl chloride has been eliminated as an aerosol propellant. Thus, while all the final results of all the scientific studies that could (and may) be undertaken are not in as yet, the present state of knowledge gives aerosol products, in normal use, a clean bill of health.

JOSEPH B. JEROME, PhD  
AMA Department of Drugs  
Chicago

**A** The use of vinyl chloride as an aerosol propellant was a common practice up until the time the public and scientific community became alerted to the probable causality between vinyl chloride and the incidence of angiosarcoma of the liver. Marketing of aerosol products containing vinyl chloride has been placed under a ban by the FDA; also, the Consumer Product Safety Commission has served notice that such products may constitute a hazard, thereby bringing them under regulation of the Federal Hazardous Substance Act (*Chem Week*, March 4, 1974; Oct 16, 1974).

Aside from the carcinogenic risk that may be posed by the inhalation of vinyl chloride, there is the hazard of another sort attending the chronic inhalation of the more ubiquitous fluorinated hydrocarbon propellants (eg, the Freon-type compounds). These gases have been shown to sensitize the myocardium to epinephrine, thereby creating a risk of ventricular arrhythmias. In addition, related compounds (eg, halothane) that are employed as anesthetic agents have been linked to cases of jaundice in patients and the increased incidence of spontaneous abortions among pregnant operating-room personnel.

In addition to the propellant, hair sprays contain, for the most part, synthetic polymers such as polyvinylpyrrolidone and polyvinyl acetate, or naturally derived polypeptides formed by the partial degradation of beef gelatin and pork collagen. Hair sprays containing synthetic polymers have been suspect in several cases of "thrombosis" (stroke), in which disseminated granulomas of the lung were noted. However, after a number of studies involving both humans and beagle monkeys, the evidence is still inconclusive as to whether the polymer particles are responsible. The polymers, polyvinylpyrrolidone and polyvinyl acetate, are not formed from vinyl chloride.

Inhalation of proteinaceous material, as in the case of polypeptide sprays, has been long known to produce hypersensitivity pneumonitis, a symptomatic clue to the cause of this disease can be elusive, inasmuch as the

Edited by George H. Tjornehoj, MD, Copenhagen, Denmark

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cough, wheezing, chest tightness, and fever generally appear several hours after an exposure. Fortunately, the effects are short-lasting and reversible, and not all persons are affected by the sensitivity reaction—usually manifested as a narrowing of the small airways. However, susceptible persons and those with known cardiac and pulmonary disorders are especially at risk and should, of course, avoid unnecessary exposure.

The pulmonary hazards of antiperspirants, on the other hand, have been studied more recently in laboratory animals by Drew et al.<sup>1</sup> They were concerned with one of the more popular ingredients, a polyethylene glycol complex of aluminum chloride-hydroxide. A granulomatous lesion was observed at the bifurcation of the broncheovascular ducts (reversibility of the lesion was undeterminable). In addition, though mixed-function oxidase activity of the liver microsomes was unaltered, lung microsomal activity was diminished. Admittedly, the concentration and extent of exposure in experimental studies may exceed conditions that might be encountered in actual use by man.

Meanwhile, other antiperspirant agents based on zirconium are under scrutiny by the FDA. Although some manufacturers have asserted that extensive inhalation studies of their zirconium formulations have presented no evidence of lung disorders, zirconium chlorhydrate compositions have been suspect. It is reasonable to expect, therefore, that the data for other zirconium compounds be irrefutable before these compounds are judged safe for human use.

In summary, it must be concluded that all aerosol consumer products are potentially dangerous to humans. Even if medical evidence is lacking or inconclusive as to how harmful these products are, their ease of accessibility, inadequate labeling, and widespread use tend to give a false sense of security. Then, too, many consumers do not exercise good judgment—either because of apathy or ignorance—and consequently expose themselves, or others, to far greater excesses than the manufacturer and government regulatory agencies may have anticipated.

R. H. WELCHER, MS  
AAA Department of Environmental,  
Public, and Occupational Health  
Chicago

1. Drew RT, Gupta RN, Bond JR, et al: Inhalation studies with a glycol complex of aluminum-chloride-hydroxide. *Arch Environ Health* 28:321-326, 1971.

## Techniques for Prevention of Nosocomial Surgical Infections

Q Our hospital surgical staff is studying postoperative wound infections, especially those due to *Staphylococcus aureus*, with the purpose of reducing and possibly eliminating such infections. Can your consultant supply national statistics on nosocomial wound infections and suggest investigative and remedial procedures?

Georgie March, MD  
Orangeburg, NY

A Surgical wound infections have not yet been eliminated, even in very low-risk populations. Approximately 5% to 15% of general surgical patients are found to acquire surgical wound sepsis when nosocomial infections

are carefully sought.<sup>1,2</sup> While *Staphylococcus aureus* continues to be an important pathogen—it was isolated from 16% of infected surgical wounds in a group of hospitals co-operating in Center for Disease Control studies—acrobic Gram-negative organisms are implicated more frequently, being isolated from about 45% of infected wounds (Center for Disease Control, unpublished data).

One cannot use the unadjusted data of other institutions to define an acceptable rate of surgical wound infection, for these rates are markedly influenced by the types of procedures performed, the characteristics of patient populations served, and the efficiency of surveillance. Therefore, many hospital infection committees look at the infection rate of a relatively standard population (such as patients with clean surgical wounds or herniorrhaphy patients) as an index of their success in controlling these infections.

Concerted efforts on the part of physicians and their hospital co-workers can do much to minimize the occurrence of nosocomial infections. The technical skill and medical judgment of the attending surgeon are among the most important variables determining the risk of infection; careful attention to standard aseptic technique, adequate debridement, anatomic closure, and other basic aspects of good surgical care do much to assure a relatively low incidence of wound infection. The effects of these practices on the occurrence of infections are difficult to evaluate, and it is unlikely that meaningful standards governing them can be established. On the other hand, many other important variables can be influenced by the hospital; indeed, some are the hospital's specified responsibilities. First, where called for, infected patients must be appropriately isolated to prevent cross infection.<sup>3</sup> Second, educational programs for personnel must stress modern infection-control practice. Third, inappropriate use of antimicrobials must be discouraged. Fourth, a clean environment must be maintained, and effective sterilization and disinfection must be assured. Finally, hospitals should conduct effective surveillance of all nosocomial infections, not just surgical wound infections. If an epidemic or other problem is recognized, a thorough epidemiologic investigation is then indicated. Most state and local health departments provide epidemiologic and laboratory support to hospitals for these investigations.

Other measures used by some hospitals to prevent nosocomial surgical infections, such as the routine culturing of samples from personnel, air, or environmental surfaces, are expensive and of dubious value in reducing the incidence or in predicting the risk of nosocomial infection; accordingly, these routine measures are not considered to be important components of a hospital infection control program.

Richard E. Dixon, MD  
Center for Disease Control  
Atlanta

1. Coase PJ, Foord T: A five-year prospective study of 23,619 surgical wounds. *Arch Surg* 107:206-210, 1971.

2. Post-operative wound infections. The influence of ultraviolet irradiation of the operating room and of various other factors. National Academy of Sciences-National Research Council. *Ann Surg* 129(suppl):1-192, 1961.

3. *Infection Techniques for Use in Hospitals*, Center for Disease Control, Washington, DC, Government Printing Office, 1970.