Occupational Acute Anaphylactic Reaction to Assault by Perfume Spray in the Face

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Background: **Perfumes have been associated with rashes in employees exposed to scented soaps or with allergic conditions, such as rhinitis or asthma, in employees exposed to perfumes or fragrances in the air.**

Methods: **Reported here is a case of an anaphylactic reaction and respiratory distress as a result of a deliberate assault with a perfume spray. The medical literature was searched using the key words "fragrances," "respiratory distress," "assault," and "health care workers."**

Results: **A female medical assistant with no history of asthma or reactions to fragrances was assaulted by a patient, who pumped three sprays of a perfume into her face. The employee experienced an acute anaphylactic reaction with shortness of breath, a suffocating sensation, wheezes, and generalized urticaria, and required aggressive medical treatment, a long period of oral bronchodilator therapy, and, finally, weaning from the medications.**

Conclusions: **Perfumes are complex mixtures of more than 4,000 vegetable and animal extracts and organic and nonorganic compounds. Fragrances have been found to cause exacerbations of symptoms and airway obstruction in asthmatic patients, including chest tightening and wheezing, and are a common cause of cosmetic allergic contact dermatitis. In many work settings the use of fragrances is limited. Assault is becoming more common among workers in the health care setting. Workers should be prepared to take immediate steps should an employee go into anaphylactic shock.(J Am Board Fam Pract 2001;14:137–40.)**

Perfumes, fragrant substances applied to the human body, have been used by men and women in Egypt since the dawn of recorded history. They were used by the Greeks, Romans, Arabs, and Europeans and have been described in cultures on all continents. In the workplace, they have been associated with rashes in employees exposed to scented soaps, or with such allergic conditions as rhinitis or asthma in employees exposed to perfumes or fragrances in the air. Rarely have they been used in assaults.

Methods

Reported here is a case of an anaphylactic reaction and respiratory distress as a result of a deliberate assault with a perfume spray. The medical literature was searched using the key words "fragrances," "respiratory distress," "assault," and "health care workers."

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Case Report

A 21-year-old woman was working as a medical assistant in a family practice office. She had no history of rashes, wheezing, allergies, or reactions to fragrances, soaps, or perfumes, and there was no history of asthma or eczema. She did have rhinitis caused by pollen allergies for which she took loratadine. She was gravida 1, para 1, and with no history of surgery, hospitalization, medical illness, or allergies to medications. She had never smoked and rarely used alcohol. There was no drug use history. Her son had no history of asthma, allergic rhinitis, or eczema. There was no family history of asthma, eczema, rhinitis, or wheezing.

On the morning in question, the employee was taking a female patient from the waiting room to an examination room. She noticed the strong odor of perfume on the patient and commented on it. The patient said she had sprayed on extra perfume so the physician would not notice she had been smoking. The patient then turned on the employee, said something unintelligible, and pumped three sprays of a perfume into her face.

Immediately the employee experienced shortness of breath and a suffocating sensation. She felt

her throat and face swell and collapsed to the floor. Coworkers took her into a treatment room, where she was found to be hypotensive and tachypneic. The physician-on-duty examined her and discovered wheezes throughout her lung fields and generalized urticaria. Epinephrine, diphenhydramine, oxygen, inhaled metaproterenol, and steroids were administered, which reversed the respiratory distress.

The urticaria and wheezing persisted, however, so the employee was transported to the hospital emergency department. In the emergency department she was again found to be hypotensive and tachypneic and was administered intravenous steroids and aminophylline. She could not tolerate spirometry. She was admitted into the hospital and started on intravenous steroids and aminophylline. That evening her spirometry reading was normal. The following day she was examined by a pulmonary specialist, who could hear no wheezes. A second spirometry test was normal. She was discharged 2 days later with tapering doses of steroids and oral bronchodilators. She returned to work 2 weeks later still using oral bronchodilators.

When seen on consultation 2 months after the incident, the patient complained of a persistent shortness of breath, relieved with twice daily bronchodilators, and a persistent sensitivity to all perfumes, but not all fragrances. She found she could not use perfumes but had no problems using soaps and other scented toilet articles. Findings of a chest radiograph, chemistry panel, and a pulmonary function test were normal. An odor challenge test was considered to be too dangerous to offer to the employee.

Eventually, the employee was weaned off the oral bronchodilator but insisted on keeping one with her at all times in case she came in contact with any perfumes. Although her assailant was arrested by the police, the disposition of the criminal case is unknown.

Table 1. Representative Constituents of Perfumes.

Class and Type	Source	Example	Use
Essential oils			
Vegetable	Flowers	Rose	Fragrance
		Jasmine	
	Leaves	Labdanum	Fixative
		Patchouli	Fragrance
	Fruits	Orange	Fragrance
		Bergamot	Fragrance
	Bark and roots	Cinnamon	Fragrance
	Grass	Vetiver	Fragrance
	Bark	Gums	Fixative
		Resins	Fixative
	Woods	Pine	Fixative
			Fragrance
		Sandalwood	Fragrance
			Fixative
	Seeds	Vanilla	Fragrance
Animal	Whales	Ambergris	Fragrance
			Blenders
			Fixative
	Musk deer	Musk	Fragrance
	Civet cat	Civet	Fragrance
Isolates			
Vegetable	Lemon oil	Citral	Fragrance
	Rose oil	Geraniol	Fragrance
	Grain	Ethanol	Solvent
			Dilution
Synthetics			
Exist in nature	Hydrocarbons and minerals	Citral	Fragrance
		Ambergris	Fixative
			Fragrance
Not existing in nature		Ionone	Fragrance
		Others	Coloration
			Preservative
			Adherence

Adapted from Wyman[1] and Groom.[2]

Discussion

Perfumes are complex mixtures of vegetable and animal extracts and organic and nonorganic compounds (Table 1). At the molecular level, they contain a range from simple to highly complex organic compounds. Many constituents are volatile, while others, which are not, provide a base for the perfume. Among the volatile organic compounds, volatility of the various constituents can vary to provide different scent effects at different phases of use. Further, perfumes are designed to react with the natural body oils of the person wearing them to provide a distinct scent. There are about 4,000 materials available for perfumes, of which 200 are frequently used.[1,2]

To create a perfume, there must be a theme, such as an oriental evening or a night in the mountains. The creators, called "noses," mix perfumes with three parts: the topnote, middle part, and the endnote. The topnote, consisting of volatile organic compounds and aromatics, is the first whiff

Table 2. Most Common Chemicals in Fragrant Products.

Ethanol
Limonene
Linalool
β-phenethyl alcohol
β-myrcene
Benzyl acetate
Benzyl alcohol
Benzaldehyde
α-terpineol
Ocimene
β-citronellol
α-pinene
Acetone
Ethyl acetate
γ-terpinene
1,8-cineole
α-terpinolene
Nerol
Camphor
Methylene chloride

Adapted from Wallace et al.[3]

that escapes from the bottle when the stopper is lifted. The middle part gives the fragrance the peculiar character that is diffused as it is worn, often reacting with the oils of the skin. The endnote gives the fragrance the lasting power and often consists of aromatics of low volatility and fixatives that cause the scent to persist. Colognes and eau de toilettes are mixtures of perfume and organic compounds that dilute the mixture, increase volatility, and decrease viscosity. Less costly substitutes for the constituents of the perfume can be used, although eau de toilette typically stays closer to the fragrance of the perfume than does cologne.[1,2]

In the laboratory many polar volatile organic compounds have been recovered from scented products, including perfumes (Table 2). These products include not only perfumes, but toilet soaps, shampoos, hairspray, shaving cream, aftershave lotion, deodorants, hand lotions, nail colorants, nail enamel remover, detergents, fabric softeners, dishwashing liquid, and air fresheners. Many organic molecules, especially highly complex natural compounds in perfumes, prove to be difficult to analyze.[3]

In mice fragrant products were found to cause combinations of sensory irritation, pulmonary irritation, decreases in airflow velocity, and neurotoxicity. In humans, perfume-scented strips in magazines were found to cause exacerbations of symptoms and airway obstruction in asthmatic patients, including chest tightening and wheezing. Exposure challenge in patients with asthma decreased the forced expiratory volume in 1 second by 18% to 58%, and a survey of 60 asthmatic patients found a history of respiratory symptoms in 57 on exposure to one or more common fragrances. In studies where the participants were exposed to hairspray, healthy persons were found to be at little risk, but in asthmatic participants and in some with allergic rhinitis and viral respiratory infections, an immediate response of the airways was documented.[4–7]

Fragrance has be targeted as the most common cause of cosmetic allergic contact dermatitis. Fragrance allergy detection is best accomplished by testing with the fragrance mixture balsam of Peru and jasmine, either synthetic or absolute. Considering the ubiquitous occurrence of fragrance materials, the risk of side-effects is small. In absolute numbers, however, fragrance allergy is common, affecting approximately 1% of the general population. Common features of contact allergy are axillary dermatitis, dermatitis of the face and neck, well-circumscribed patches in areas where perfumes are dabbed on (eg, the wrist and behind the ears), and aggravation of eczema. Fragrance allergies have been implicated as the offending agent in the multiple chemical sensitive syndrome, and fragrances have been implicated as one of the causes of the sick building syndrome. Contact dermatitis caused by airborne fragrances has been described.[8–12]

Plecebo-controlled challenges with perfumes in patients with asthma-like symptoms have documented airway hyperreactivity. Along with pets, medicines, plants, dust storms, physical exercise, and humidity, perfumes were found to be a risk factor in asthma in children. The occupational exposure to scented gravel in cat litter boxes has been implicated in an acute asthmatic event. Flowers and birch twigs were found to elicit symptoms in patients with asthma and rhinitis symptoms.[13–16]

This case represents two trends: the incidence of allergic reactions to perfumes and assaults on health care personnel. Clearly, this case does not represent the normal or customary use of perfumes. It is quite possible this patient would never have had any allergic symptoms to perfumes had she not been assaulted in this manner. Yet, when exposed

to a large amount of perfume sprayed directly into her face, she had an acute allergic anaphylactic reaction. Although challenge tests were thought to be too dangerous to attempt, the allergic nature of the incident is reflected by the acute onset, urticaria, and wheezing. In contrast, a toxic disease would have been slower in onset and without the typical urticarial rash. Now that the patient has a documented allergy to perfumes, she has had to be instructed on how to avoid them.[17]

Avoidance of perfumes is particularly difficult in a modern society with so many scented products. The patient, however, has already documented that she can tolerate these products, so it is the perfumes (including eau de toilette and cologne) that she must avoid. This outcome was quite distressing to her because she views her perfumes as an integral part of her femininity.

Regardless of the cause, an acute anaphylactic reaction in a physician's office is a sobering event and requires immediate medical treatment. Dillon[18] has underscored the need for medical treatment facilities to be prepared and have equipment and materials at hand. Epinephrine (1:1000, 0.3–0.5 mL, subcutaneously, every 15–20 minutes as needed for adults), diphenhydramine (50 mg every 6–9 hours, orally or intramuscularly, for adults), and oxygen remain the mainstay. Albuterol nebulizers (0.5%, 0.5–1.0 mL in 2.5-mL saline for adults) or inhalers (2 puffs every 4 to 6 hours for adults) are also typically used in the office. More aggressive medications are usually reserved for the emergency department.

It is difficult to imagine how this occupational injury could have been avoided. In many occupational settings, especially in closed spaces such as airplanes, the use of fragrances is already limited. Assault is becoming more common among workers in the health care setting, but it is difficult to consider every person who enters the office wearing perfume to be a potential assailant. The one fortunate thing for this woman was that competent medical care was immediately available.

Conclusion

Sprayed perfumes can now be added to the long list of methods of occupational assault. The many organic compounds present in perfumes have been documented to cause or exacerbate asthma, eczema, or dermatitis. This case represents an incident of acute asthmatic symptoms in a person with pollen allergies when exposed to a large amount of perfume

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