

Optimizing Topical Axillary Perspiration Control

Zoe Diana Draelos, MD



Controlling axillary perspiration can be a challenge for dermatologists. When perspiration is related to anxiety, the challenge is even greater. Who would have thought that our armpits could be a mirror of our inner state of repose? While there are many methods for controlling perspiration with oral medications and injectable neurotoxins, the product most commonly used to control axillary sweating is topical antiperspirant. A casual evaluation of the contents of US Transportation Security Administration–approved carry-on bags of liquids revealed that every bag contained a topical antiperspirant of some type. From a sales perspective, topical antiperspirants are a big-volume business in the United States and usually occupy a half isle display in mass merchandisers, such as Target, Walmart, and Walgreens.

Topical antiperspirants are available in a variety of formulations such as stick, cream, gel, and aerosol spray yet the active ingredient is an aluminum-containing compound in each of them. The health safety of topical antiperspirants has been debated for years. Most recently, topical antiperspirants have been linked to breast cancer in the media but no medical relationship has been established. While topical antiperspirants are not to be worn during breast mammography examinations, the restriction is not related to breast cancer. The US Food and Drug Administration expressed some concern in 1978 regarding the long-term inhalation risk of aerosol antiperspirants; however, these preparations remain on the market.

The first antiperspirant, composed of a 25% solution of aluminum chloride hexahydrate in distilled water, was introduced in 1916. This highly effective formulation only required application every other day but was extremely irritating and the low pH level damaged

Dr. Draelos is Consulting Professor, Department of Dermatology, Duke University School of Medicine, Durham, North Carolina.

The author reports no conflict of interest in relation to this article.

Correspondence: Zoe Diana Draelos, MD (zdraelos@northstate.net).

clothing. The need to develop a topical antiperspirant that controls sweat yet is compatible with skin and clothing has led to all of the currently marketed products. This article takes a critical look at topical axillary perspiration control.

Antiperspirants vs Deodorants

The words antiperspirant and deodorant are sometimes used interchangeably in the common vernacular, but to the cosmetic chemist these are 2 very different personal care products. Antiperspirants contain ingredients to decrease sweating, while deodorants are used solely to manage axillary odor. For this reason, all antiperspirants can be considered deodorants, but not all deodorants are antiperspirants. Table 1 lists the mechanisms for axillary odor control. Most products currently on the market are both antiperspirants and deodorants.

Perspiration and Axillary Odor

Perspiration is the perfect medium for bacterial growth, which accounts for the axillary odor associated with sweating. Axillary odor is caused by the action of bacteria on sterile apocrine and eccrine sweat. Apocrine sweat is responsible for a large part of the odor because it is rich in organic materials. Eccrine sweat, on the other hand, is more dilute and does not provide a high concentration of nutrients for bacterial growth. However, eccrine sweat indirectly promotes axillary odor by dispersing apocrine sweat over a larger area and providing the moisture necessary for bacterial growth. Axillary hair also contributes to odor by acting as a site for apocrine secretions to collect and increases the surface area suitable for bacterial proliferation.

Deodorants function either by masking the axillary odor with a perfume or decreasing axillary bacteria growth. Therefore, many deodorants contain antibacterials, such as quaternary ammonium compounds (benzethonium chloride) and cationic compounds (chlorhexidine, triclosan).

Mechanism for Perspiration Control

Topical antiperspirants reduce axillary moisture by employing aluminum salts to create a plug within the

TABLE 1

Mechanisms for Axillary Odor Reduction

Reduce apocrine gland secretions
Reduce eccrine gland secretions
Remove apocrine and eccrine gland secretions from the axilla
Decrease axillary bacterial colonization

acrosyringium to occlude apocrine and eccrine ducts. Sometimes the aluminum is combined with zirconium to enhance efficacy. It takes about 10 days to create the plug, which physically blocks the transport of sweat from the gland onto the skin surface. Conversely, it takes 14 days for the plug to dissolve. It is for this reason that the best results with topical antiperspirants are achieved with daily use to maintain the acrosyringial plug.

In order for the antiperspirant to work it must physically contact every sweat duct. Even and thorough application to the entire axillary vault is necessary for optimal results. Some topical antiperspirants have a grid to encourage even application and metered dosing administered through turning a knob at the bottom of the applicator. Using the amount of antiperspirant recommended on the package label is important.

Antiperspirant Efficacy

An efficacious antiperspirant must reduce axillary sweating by at least 20%. The degree of sweat reduction is determined partly by the formulation. Table 2 lists the efficacy of a variety of currently marketed formulations. Notice that the efficacy range is broad but overall aerosols are the least effective and roll-ons are the most effective. This is due to the ability of the product to contact all of the sweat ducts in the axilla to deliver an optimal dose.

Antiperspirants are considered over-the-counter drugs and thus must follow the rules set forth in the monograph covering their formulation. The types of materials that can be incorporated in antiperspirants and their concentration are carefully controlled by the US Food and Drug Administration. This accounts for the similarity in formulation by a variety of manufacturers.

A new category of topical antiperspirants that have been introduced are labeled as “clinical strength”

TABLE 2

Efficacy of Topical Antiperspirant Formulations

Formulation	Sweat Reduction, %
Aerosol	20–33
Cream	35–47
Liquid	15–54
Lotion	28–62
Roll-on	14–70
Stick	35–40

products. These products have a slightly higher concentration of active ingredient that must reduce sweat by 30% to substantiate the highly effective claim on the package labeling, but also are recommended for twice-daily use. Twice-daily use is actually the key to their enhanced efficacy. The antiperspirant must remain in the axillary vault long enough to form or maintain the plug in the acrosyringium. If heavy sweating occurs during application, the antiperspirant is washed away and rendered ineffective. Because the armpit is generally at rest at night, bedtime application of topical antiperspirants allows the ingredients to contact the skin longer and create a better acrosyringial plug that translates into enhanced efficacy. Increased efficacy can be achieved with any topical antiperspirant that is used both morning and evening.

The most effective antiperspirants create a deep plug in the acrosyringium. The more superficial the acrosyringial plug the less sweat control is obtained. Unfortunately, there is a direct connection between skin irritation and acrosyringial plug depth. Efficacious formulations must address both issues to create a skin-friendly product. Some manufacturers include skin-protecting ingredients, such as dimethicone in topical antiperspirant formulations to increase efficacy while counteracting the inherent possibility of irritant contact dermatitis.

Antiperspirant Failure

Antiperspirants can and do fail to meet patient expectations for sweat control. As a matter of fact, most of the patients who seek out the help of a dermatologist for the purpose of discussing sweat control are antiperspirant failures. There are a few easy tips that the dermatologist

COSMETIC CONSULTATION

might wish to share with patients in need of assistance in controlling perspiration:

1. *Apply topical antiperspirants to dry armpits*—The antiperspirant must remain in physical contact with the acrosyringium long enough to create a plug. If the antiperspirant is applied to a wet armpit, either wet from showering or from perspiration, it will be diluted and not as effective. The armpit can be dried with a hair dryer before antiperspirant application if necessary.

2. *Do not shave aggressively*—Plugs created in the acrosyringium can be physically removed by shaving if they are located close to the skin surface. Individuals who shave repeatedly over the armpit area or shave multiple times daily may notice decreased antiperspirant efficacy. It is best to shave the armpits weekly by dragging the razor once over the skin and avoid pulling the skin tight. This minimizes the chance of removing the sweat duct plug.

3. *Apply the recommended amount of antiperspirant*—Many topical antiperspirant instructions recommend twisting the knob at the bottom of the applicator 3 times and applying the dispensed amount to the axilla. This is the dose needed to obtain optimal efficacy. Encourage patients to read the instructions and understand that just like medicines that do not work if enough is not ingested, antiperspirants also require the proper dose for optimal efficacy. The recommended amount should be thoroughly massaged throughout the armpit, especially over hair-bearing skin where concentration of sweat glands is the greatest.

4. *Apply topical antiperspirant daily*—Compliance is the key to many things in medicine, including antiperspirant efficacy. As with any topical dermatologic treatment if

you don't use it, it doesn't work. Individuals who apply topical antiperspirant sporadically will not experience optimal sweat control. Daily application is necessary for efficacy, and twice-daily application is even better as previously discussed. Consecutive application for 10 days is necessary to determine the optimal benefit that can be achieved from a given antiperspirant formulation.

Summary

Topical antiperspirants are the most widely used method for controlling axillary perspiration. Proper application is the key to achieving the best results. Topical antiperspirant should be applied liberally to the entire axilla in the morning and in the evening to reduce perspiration. In general, roll-on cream products offer the best efficacy but care should be taken to apply the dose recommended on the package. Shaving can decrease topical antiperspirant efficacy by physically removing the plug from the acrosyringium. For this reason, aggressive armpit shaving by pulling the skin and shaving repeatedly over the skin should be avoided. Finally, compliance is important because daily application is necessary to maintain the acrosyringial plug. The optimal effect for any antiperspirant can only be assessed after 10 consecutive days of use. These are a few ideas that dermatologists can share with patients in search of better topical axillary sweat control.

Recommended Reading

Papa C, Kligman AM. Mechanisms of eccrine anhidrosis. II. the antiperspirant effect of aluminum salts. *J Invest Dermatol.* 1967;49:139-145.

Holzle E, Kligman AM. Mechanism of antiperspirant action of aluminum salts. *J Soc Cosmet Chem.* 1979;30:279-295. ■