

The Art of Eyelash Beautification

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What cosmetic would most women want to have with them if they were marooned on a desert island? Sunscreen? Lipstick? Facial foundation? In my experience in cosmetic dermatology, the correct answer is mascara. Mascara is an interesting concoction designed to lengthen, darken, curl, and thicken the eyelashes. You may ask why so much attention is focused on these fine short hairs that emanate from the upper and lower eyelids with a relatively short anagen growth cycle. It is because long eyelashes are considered a sign of female beauty.

Women have long prized long eyelashes. The original method for elongating the appearance of the eyelashes was the eyelash curler. This tool, popularized in the 1960s, looked like a medieval torture device. The eyelashes were placed in this scissorlike contraption with rubber stoppers. When the device was closed, the eyelashes bent upward into a more acute angle. This reduced the natural curve of the eyelashes and allowed the eyelashes to look longer. Eyelash curlers can still be purchased today, but the newer models are heated, much like a curling iron. The warmth re-forms the water-deformable bonds in the eyelash hairs, allowing the eyelashes to curl.

The next major development in eyelash elongation was a cosmetic known as mascara. The original mascara was worn by women in antiquity and was made from antimony trisulphide, more commonly known as kohl. Because the safety of kohl around the eyes was questionable, a more modern formulation was developed in the form of a cake that was composed of sodium stearate soaps and lampblack. The product

was mixed with water, stroked from the cake with a brush, and applied to the eyelashes. This formulation produced immediate eye irritation from the sodium stearate and was later reformulated with triethanolamine stearate. Beeswax subsequently was added to the formulation to allow the product to be somewhat water resistant.

Even though the use of mascara dates back to biblical times, newer formulations are worth discussing for their dermatologic implications. This article reviews the different modern mascara formulations and points out the patient issues for each type.

Mascara Colors

The US Federal Food, Drug, and Cosmetic Act strictly controls the colors that can be used around the eyes. Colors made from coal tar are prohibited; thus, mascara colorants must be selected from vegetable colors or inorganic pigments and lake colors. Pigments that are used in modern mascara formulations include iron oxide to produce black, synthetic brown oxide to produce brown, ultramarine blue to create navy, brown ochre to create yellowish brown, and burnt sienna to produce dark brown.

Basic Mascara Formulations

Modern mascaras are available in several formulations (Table). Each formulation has certain advantages and disadvantages in a given population. Cake mascaras are the oldest formulation and are the most difficult to apply. Cream mascaras were introduced next, but liquid mascaras applied from an automatic dispensing tube dominate the modern marketplace. A discussion of the utility of each formulation in different patient populations follows.

Cake Mascara

The original cake mascara was composed of soap and pigments compressed into a cake. The cake was stroked with a water-moistened brush and that was applied to the eyelashes. Unfortunately, this

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formulation was not water resistant and smudged with tears or perspiration.

The cake formulations of mascara virtually have disappeared, but black powder compressed eye shadow has taken its place. Many cosmetic companies, such as MAC, make a black powder cake mascara compact that can be moistened with a wet brush to form a paste. The powder adheres to the brush and can be stroked over the eyelashes where it dries to a thin film to pigment the eyelashes. While most patients would find this mascara formulation cumbersome, patients with multiple allergies and extremely sensitive eyes will find the black powder cake mascara a welcome alternative.

This type of mascara has few irritants and allergens, no fragrance, minimal preservatives, and low risk of contamination as long as the cake dries between uses. Individuals who claim they cannot wear any kind of commercially available mascara usually can tolerate the modern black cake formulation. Individuals with ocular rosacea also may find this type of mascara helpful because it does not block the eyelash follicular ostia or provide a substrate for bacterial growth.

Cream Mascara

The cake mascaras gave way to the cream mascaras. The cream mascaras were made from pigment suspended in a vanishing cream base that was brushed from a tube onto the eyelashes. This formulation had better water-resistance abilities than its cake predecessors. However, the cream mascara quickly disappeared when the automatic tube was developed that could accommodate only liquids. No cream mascaras remain on the market today.

Liquid Mascara

Liquid formulations have dominated the mascara market since the automatic tube was introduced. The automatic tube consists of a cylinder with a brush that can be repeatedly inserted and removed through an aperture to deliver a metered amount of product to the eyelashes.

Water-Based Liquid Mascara

The first liquid mascaras developed were water-based. Water-based mascaras are so named because they are

Eyelash Cosmetics

Eyelash Cosmetic	Main Ingredients	Functions	Adverse Reactions
Cake mascara	Soap, pigments	Darken and thicken eyelashes	Irritation due to soaps
Cream mascara	Vanishing base, pigments	Darken and thicken eyelashes	Irritant contact dermatitis
Water-based liquid mascara	Resins, waxes, pigments	Darken and thicken eyelashes	Irritant and allergic contact dermatitis
Solvent-based liquid mascara	Petroleum distillates, waxes, pigments	Darken and thicken eyelashes	Irritant and allergic contact dermatitis
Water- and solvent-based hybrid mascara	Water-in-oil or oil-in-water emulsion	Darken and thicken eyelashes	Irritant and allergic contact dermatitis

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formulated of waxes (beeswax, carnauba wax, synthetic waxes) in addition to pigments (iron oxides, chrome oxides, ultramarine blue, carmine, titanium dioxide) and resins dissolved in water. They are classified as oil-in-water emulsions. The water evaporates readily, creating a fast-drying product that thickens and darkens the lashes. The product is water-soluble, allowing for easy removal, but unfortunately it smudges with tearing and perspiration. Some water-based mascaras are labeled “water resistant” if they contain an increased amount of wax or a polymer to improve the adherence of pigment to the lashes.

Water-based mascaras are easily contaminated with bacteria, which grow readily in water, and thus must include preservatives, usually parabens. As result, these products may potentially cause an allergic reaction in paraben-sensitive individuals; however, water-based mascaras are generally the least sensitizing of the mascara types. Some individuals may experience contact irritation from the emulsifiers required to maintain the pigment in solution.

Of all the mascaras, the water-based products are the best for individuals with sensitive skin or eye problems such as ocular rosacea. These mascaras do not require a special solvent for removal and can be removed thoroughly with soap and water. This prevents the accumulation of mascara in the eyelash follicular ostia, which can be a contributing factor to sebaceous gland occlusion and the initiation of disease. When in doubt, recommend that patients select a water-based mascara if they complain of eye irritation or other eye cosmetic-related problems.

Solvent-Based Liquid Mascaras

Many consumers, however, want a mascara that does not smudge with water contact. Water-based mascaras can migrate with tearing and perspiration. This created the need for the next solvent-based mascara formulation. Solvent-based mascaras are formulated with petroleum distillates to which pigments (iron oxides, chrome oxides, ultramarine blue, carmine, titanium dioxide) and waxes (candelilla wax, carnauba wax, ozokerite, hydrogenated castor oil) are added. A special removal solvent must be used to remove the mascara, which also can remove the sebum from the tender periorbital skin. The most common cause of cosmetic-related eyelid dermatitis is use of eye cosmetic removal products. Sometimes puzzling refractory steroid-dependent eyelid dermatitis can be treated easily by switching to a water-based mascara.

Incomplete removal of the waterproof mascaras can cause problems with eyelash breakage. The mascara stiffens the eyelashes, which are crushed on the pillow during sleep. Patients that are experiencing eyelash breakage, identified by loss of the tapered eyelash tip, should be encouraged to use water-removable mascaras to avoid unnecessary eyelash loss.

Solvent-based mascaras may be preferred in patients with recurrent eye infections because this formulation does not support bacterial growth. Although preservatives are still added, microbial contamination is not a great problem because the petroleum-based solvent is antibacterial. Solvent-based mascaras also are preferred in patients who have problems with their extended-wear contact lenses. The extended-wear lenses are designed to absorb water to maintain their hydration. This means that they also will absorb water-soluble mascaras, which can damage or stain the lens. This is not as much of a problem with the solvent-based mascaras.

Water-Based and Solvent-Based Hybrid Mascaras

The newest mascaras combine both water-based and solvent-based systems to form either a water-in-oil or oil-in-water emulsion. The idea is to create an optimal product that thickens the eyelashes in a short drying time, like the water-based mascaras, as well as provides waterproof lash separation, like a solvent-based mascara. Some of these combination mascaras contain a film-forming polymer that dries to form a tube around the eyelash. The eyelash tube thickens, darkens, and elongates the eyelashes better than any other formulation. For individuals with eyelash loss, the polymer mascaras provide the best cosmetic camouflage. Some of these new mascaras are applied with a complex brush or silicone comb designed to coat each surface of the eyelash and prevent the eyelashes from clumping.

Lash-Curling Mascaras

Another advance in mascara technology is the introduction of the automatic lash-curling mascara. This type of mascara is designed to curl the eyelashes without the use of the mechanical eyelash curler previously discussed. These mascaras also are based on polymers. As the polymer dries, it contracts and thus increases the curvature of the hairs, giving them a more curved appearance.

Lash-Thickening Mascaras

In addition to lash curling, some mascaras are formulated to thicken and elongate the lashes. These mascaras incorporate small fibers into the formulation that can stick to the eyelashes, making them appear thicker and longer. They are not hair-growth products. With the introduction of topical prescription drugs for lash elongation (Latisse), the focus on eyelash growth has increased. Eyelash-growth drugs can be used with mascaras, but these topical agents can dry the eyelashes because of the presence of the drug solvent. There are some eyelash-conditioning mascaras that may prevent the solvent-based mascara eyelash damage that results in eyelash fracture.

Medical Problems Related to Mascara Use

The most substantial medical problem associated with mascara use is infection. *Pseudomonas aeruginosa* corneal infections have been reported, which can

compromise visual acuity. *Staphylococcus epidermidis* and *Staphylococcus aureus* organisms can proliferate in contaminated mascaras, which is why mascara tubes should not be shared and should not be used for more than 3 months. Infections are more common if the eyeball is traumatized with the infected mascara. As mentioned previously, individuals with recurrent bacterial infections due to colonization probably should select solvent-based mascaras.

Mascara pigment also can cause a conjunctival pigmentation if the mascara is washed into the conjunctival sac by lacrimal fluid. This colored particulate matter can be observed on the upper margin of the tarsal conjunctiva. Histologically, the pigment is seen within macrophages and extracellularly with varying degrees of lymphocytic infiltrate. Electron microscopy suggests that ferritin, carbon, and iron oxides are present within the eye tissues. Unfortunately there is no treatment for the condition, which fortunately is usually asymptomatic. ■