

## **Allergens found in mascara and extensiveness in which they can affect individuals with a potential towards developing allergies**

### **ABSTRACT**

A significant number of eye cosmetic products represent a frequent cause of eyelid Allergic Contact Dermatitis (ACD). These cosmetics routinely contain in their list of ingredients irritant factors such as tints, fragrances, preservatives or vehicle-agents. We present an in-detail overview of how these materials affect patients who display an allergic reaction after usage of cosmetic products that contain the substances mentioned above. Some of the cases discussed in this paper reference that of a 44-year-old woman with a 10-month history of periorbital and eyelid dermatitis (caused by black iron oxide), a study conducted on 4454 patients, by the North American Contact Dermatitis Group to evaluate the prevalence of allergic reactions triggered by paraben-containing mascaras, and 11 reports of eyelid ACD caused by shellac in mascaras or eyeliners.

**Background:** Allergic reactions triggered by the use of mascaras and other cosmetic products are common.

**Objectives:** We sought to identify common allergens found in mascaras and to explore the extent each of these components affects patients that suffer from or are prone to developing eyelid ACD.

**Methods:** We have performed a retrospective, cross-sectional analysis.

**Results:** While parabens are one of the most widely avoided by consumers of cosmetic products, being considered a major allergy-inducing factor, fragrances appear to have a much more considerable adverse effect on individuals (~1% of the general public in U.S.). Given

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the fact that ,Fragrance' is a term that can encompass a variety of components that are not listed on the label appropriately, the construction itself is not considered to be properly regulated by the FDA.

Keywords: cosmetics, allergens, parabens, mascara, shellac, black iron oxide

## **1. Introduction**

Allergic contact dermatitis (ACD) is one of the manifestations of eczema, triggered by an allergic reaction to a substance containing allergens, when in contact with the skin surface.

To individuals who do not display any adverse response to this material, allergens are harmless.

Allergic contact dermatitis (ACD) can also result from the usage of various cosmetic products that contain this particular substance in the list of ingredients, among which a significant number of mascaras. Since this product is applied from the base of the eyelashes, the reaction that occurs in patients prone to this form of dermatitis is called eyelid ACD.

The list of symptoms an allergic person may experience when applying mascaras that include said allergens in their formula could vary as follows: rashes across the eyelid, red bumps (similar to hives) and blisters accompanying the rash, dry skin patches, pain, itching or a burning sensation, or even bloodshot eyes.

Before trying a new mascara, a simple patch test using a sample of the product applied on the skin can reveal the potential for allergy or sensitivity to the particular formula. In case any ACD signs appear, a dermatologist can conduct further investigations to reveal the exact allergen that triggered the reaction. Choosing hypoallergenic makeup, or specifically

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hypoallergenic mascara over conventional alternatives represents an important first step towards avoiding any allergic reaction. Nonetheless, knowing and avoiding these substances is the best way to prevent ACD.

## **2. Allergens found in mascara and extensiveness in which they can affect individuals with a potential towards developing allergies**

### **2.1. Fragrances**

„Fragrance” is a broad term used to describe aromatic chemical substances or concoctions. Fragrances or perfumes are used in various industries from food to cosmetics. In mascaras, they are used to improve the smell of the formula or to imitate a natural aroma. The tricky part is that fragrances are considered trade secrets, so the tens or hundreds of substances used to create a specific smell are labelled under the umbrella-term “Fragrance” or “Flavour” under the current U.S. Food and Drug Administration (FDA) regulations.

But according to American Academy of Dermatology (AAD) estimates [10], 1% of the general public in U.S. presents allergies when in contact with fragrances, which make these ingredients the number one cause of cosmetic ACD.

### **2.2 Parabens**

Parabens are a group of 5 different paraben esters; propyl-, butyl, methyl-, ethyl-, and benzyl-parahydroxybenzoate. They are often used as a mix of 2 to 5 of these esters as preservatives in the food industry, pharmaceuticals and cosmetics.

Parabens aroused suspicions to the general population, especially with the latest natural and organic oriented beauty trends. In reality, they’re one of the best choices when it comes to

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preservatives, triggering allergic reactions for a much lower percent of consumers as compared with the alternatives. The North American Contact Dermatitis Group (NACDG) conducted patch testings on 4454 patients suspected of suffering from ACD, and results revealed that 1.2% of them had positive reactions. Parabens were used in various combinations during the tests [9].

Aside from these popular allergens commonly used in the cosmetic industry, below we listed out less-known allergens specific to mascara:

### **2.3. Shellac**

The shellac comes from the female *Coccus lacca* insect, indigenous to Thailand and India forests. This insect excretes the shellac in its natural environment, which is then harvested and refined in raw shellac flakes. Dissolved in an alcoholic base, the resulting thin, quick-drying film is used in various industries but is most commonly known as a furniture varnish. Due to its properties, it is used as a curling-agent in mascaras, in hair dyes, and fixatives.

In the specialised literature we found 11 reports of eyelid ACD caused by shellac in mascaras or eyeliners [1, 2, 3, 4, 5]. This is a relatively small number of (reported) cases considering that shellac is increasingly used in the eye makeup industry. One possible cause may be the fact that it is sometimes detected as the trigger allergen only in patch tests that checks for a potential reaction to each ingredient in the product.

### **2.4. Black iron oxide**

Also called magnetite, this ingredient forms naturally in mineral deposits. In the cosmetic industry, it is produced in synthetic forms and used as for its tinting properties. Pending by the mixture of oxides used, the colours may vary from black to red and orange.

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There are two documented cases of allergic reactions to black iron oxides in mascara presented by Saxena M. et al. [6]. A 44-year-old woman with a ten months' history of periorbital and eyelid ACD presented strong reactions to patch testing of 5% concentration of black iron oxide in samples provided by the mascara manufacturer.

The raw materials necessary to produce synthetic iron oxides come from natural mineral deposits. These materials often present traces of heavy metals. FDA regulates the levels of heavy metals in iron oxides and values below the threshold are considered harmless to consumers.

## **2.5. PPD**

The American Contact Dermatitis Society (ACDS) declared para-phenylenediamine (PPD) the Contact Allergen of the year 2006. PPD is a chemical substance used in for its colouring properties in many industries, from textiles to rubber, oils to photography, and even in temporary tattoos. In cosmetics, it is especially used in hair dye formulas and tinting mascaras.

PPD allergies can lead to hair loss via the irritation of the scalp when contained in hair dyes, hand eczema for hair-dressers or eyelash loss when triggered by the use of mascaras [7]. The number of these allergies is considered to be much larger than the reported cases mainly because consumers were able to identify the allergy source in the hair dyes.

## **2.6. Propylene Glycol**

Propylene Glycol (PP) is a synthetic organic compound, and half of the quantities produced are used in cosmetics, as a skin conditioning agent.

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PG can trigger various cutaneous reactions: irritations, urticarial manifestations, and less frequently ACD. In a study conducted by University of British Columbia Contact Dermatitis Clinic for two years on 828 allergic patients, the prevalence of positive patch test reactions to PG was 1.57%, thus being one of the most common allergens in mascaras.

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