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Irritant reactions to leave-on cosmetics and other products

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Leave-on cosmetics, such as eye make-up, eye make-up removers, and foundations may occasionally be responsible for irritant reactions following repeated use, or when patch tested “as is.” Here we present some examples and discuss the possible causes.

OBSERVATION

We observed irritant patch test reactions to an eye-make-up base and to a foundation both tested “as is” (Figure 1) in a patient who reported occasional mild dermatitis on her face and eyelids. On examination we found that the components listed at the top of the formulations of each cosmetic contained both C11-13 isoparaffin and isododecane

(C10-14). These are mixtures of branched-chain aliphatic hydrocarbons derived from petroleum distillate.

DISCUSSION

C11-13 isoparaffin (CAS no. 246538-78-3) has solvent properties, whereas isododecane (CAS no. 31807-55-3/93685-81-5/13475-82-6) also has emollient and perfuming functions. Various other isoparaffins, as well as isohexadodecane, isohexadecane, isoeicosane, and isooctane are also used in cosmetics. These have solvent, skin-conditioning, and, sometimes, viscosity decreasing and emollient properties.

These ingredients are not only present in waterproof eye make-up, such as mascara, eye liner, eye shadow, and eye-shadow bases, and in the respective eye make-up removers (generally formulated as a two-component solution that needs to be mixed before use), but also in hair conditioners, shower gels, antiperspirants, deodorants, colour cosmetics (foundation creams [make up] containing colouring agents such as ferric oxides), sun-care, and skin-care products.

In 1986, in their final report on the safety assessment of cosmetic grade petroleum distillate,¹ the Cosmetic Ingredient (CIR) Review Expert Panel stated that, “although petroleum distillate is used in cosmetic products in concentrations as great as 25% to 50%, it is tolerated satisfactorily by the skin, though such products in the form of eye shadow, mascara, or other eye make-up can be irritating to the eye”. They concluded that these components were safe in the actual concentrations of use and this was confirmed in 2005.² In 2012,³ the CIR Review Expert Panel published a safety assessment of 24 isoparaffins, of which 15 mainly function as solvents in cosmetics: C7-8, C8-9, C9-11, C10-11, C10-13, C11-12, C11-13, C12-14, C13-14, C13-16, and C18-70 isoparaffins, isododecane, isoeicosane, isohexadecane, and isooctane.



FIGURE 1 Irritant patch-test reactions (day 2 reading) of (left) eye make-up base and (right) foundation



FIGURE 2 Severe irritant patch-test reaction to Cavilon No Sting Barrier Film spray (3M, Diegem, Belgium)

The results of a personal-care products industry survey had indicated that concentrations of the ingredients used ranged from 0.0001% (C13-14 isoparaffin) to 90% (isododecane). The CIR Expert Panel noted that most of the available data were related to oral or inhalation exposure to isoparaffins and that the dermal and ocular exposure data that were available suggested mild ocular irritation and mild-to-severe skin irritation, but no sensitization or photosensitization, nor phototoxicity. Based on relevant animal and clinical data they also concluded that these ingredients were safe in the present conditions of use and concentration described in the safety assessment.

According to a report published in 2015⁴ “hydrocarbon solvents evaporate from the skin relatively rapidly, without consequence, although repeated exposures may cause dryness from defatting the skin. However, when evaporation is impeded, as for example by the use of occlusive patches, then skin contact can lead to severe dermal irritation and skin damage, with, in general, the lower molecular weight hydrocarbon solvents being more irritating to the skin than their higher molecular weight counterparts.” This finding thus explains the mild dermatitis on the eyelids and face observed in our patient, and certainly the irritant patch test reactions to the eye-make-up base and foundation. We have previously observed similar reactions when testing waterproof mascaras and their respective removing lotions, and also a severe irritant patch-test reaction to Cavilon No Sting Barrier Film spray (3M, Diegem, Belgium), which contains 5% to 30% of isooctane (Figure 2).

In an article on stoma-care products responsible for peristomal dermatitis,⁵ the authors identified numerous stoma skin care products as triggers of irritant and/or allergic contact dermatitis. The most common product used and/or involved in dermatitis was found to be Cavilon No Sting Barrier Film. The majority of cases were considered to be irritant contact dermatitis, but some reactions were interpreted as

being allergic, although no specific ingredient could be identified as the sensitizing cause.

CONCLUSION

Certain leave-on cosmetics may contain petroleum distillate products, such as isoparaffins or other branched-chain aliphatic hydrocarbons, which may cause irritancy under occlusion, eye make-up and related eye care products being most often involved. In view of the irritant capacity of these volatile solvents, the application sites should be allowed to completely dry before being occluded. Moreover, other products, such as certain wound and stoma care products cause similar problems. In order to diagnose contact allergy from other ingredients present, such products should not be patch tested “as is,” but tested using semi-open testing or perhaps repeated open application testing⁶ to avoid irritancy.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to report.

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