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Combined effects of allergens and irritants

Summary resumé

Contact dermatitis (CD) is a common disease in the population and the most frequently recognised occupational disease in Denmark. CD can be due to either allergy or irritation and many clinical cases are due to a combination of both allergic and irritant contact dermatitis. Some recent studies have indicated an increased skin reactivity from combined exposures to allergens and irritants, and in addition a decreased threshold value for reaction to allergens. Typical examplesof combined exposures are consumer products, cosmetics or cleansing products, where numerous contact allergens may be present in combination with detergents. Simultaneous exposure to a combination of two irritants often occurs in "wet work" and an interaction between two different irritants has been reported. Moisturisers containing preservatives are often used for treatment of CD. Many of these preservatives are contact sensitisers and the threshold value for a reaction to the preservative in already-sensitised individuals depends among other things on the potency and penetration of the allergen. Recent studies have indicated that pre-treatment of the skin with moisturisers with a high lipid concentration may facilitate penetration and increase skin response to allergens and irritants.

The present Ph.D.- thesis entails four clinical experimental studies. Participants in the studies were eczema patients previously tested positive to methyldibromo glutaronitrile (MDBGN) and healthy volunteers. For both allergic and irritant reactions patch testing and repeated open application test (ROAT) were used. Visual reading and non-invasive bioengineering techniques (transepidermal water loss (TEWL) and skin colour measurements) were used to evaluate skin reactions.

The irritant sodium lauryl sulphate (SLS), a skin-barrier-disrupting detergent was used as a model irritant together with ethanol (Eth), an inflammatory-generating disinfectant. The model allergen MDBGN, a preservative frequently used in liquid soaps and moisturiser, was used as an experimental allergen.

THE AIMS OF THE THESIS WERE:

1. To evaluate the combined effect of the preservative MDBGN and SLS on the elicitation response of allergic contact dermatitis in MDBGN allergic individuals.

2a. To evaluate if the lipid content of a moisturiser influences the risk of elicitation of MDBGN allergy in already sensitised individuals.

2b. To evaluate if 50 or 100 ppm MDBGN in a moisturiser (leave-on product) can be tolerated by MDBGN sensitised individuals.

3a. To test if alternate application of disinfectant/detergent causes more skin irritation than disinfection and detergent applied alone.

3b. To test if repeated disinfection with detergent causes more skin irritation than repeated skin disinfection with alcohol-based disinfectant.

3c. To evaluate if changes in skin reactivity occur 4 weeks after experimental skin irritation.

The combined exposure to MDBGN and SLS significantly influenced the skin response to MDBGN, which was augmented by a factor 6.4. Combined exposure to MDBGN/low fat vehicle and MDBGN/high fat vehicle showed an increased response to the allergen combined with a low fat vehicle. However, the low lipid vehicle was easier dosed and therefore an increased amount of low lipid moisturiser was used. In addition, a safe level of use for MDBGN in a leave-on product was shown to be less than 50 ppm.

The combined effects of two irritants showed that alternate exposure to alcohol-based disinfectant/detergent showed no increased skin response compared to application of detergent separately. Moreover it was shown that hand disinfection with alcohol-based solution is less skin irritating than hand disinfection with detergent. Indications of decreased skin reactivity 4 weeks after skin irritation with alcohol solution was found, but further studies are needed to elucidate details.

In conclusion, combination of MDBGN and SLS increased the allergic response compared to separate application in MDBGN allergic patients. This finding is important concerning safe threshold values for allergens, since these may be markedly changed in the presence of detergents. Furthermore, it was found that 50 ppm is not a safe level of MDBGN in a moisturiser. This has been part of the documentation supporting the ban of MDBGN in all types of cosmetic products coined by the Scientific Committee on Cosmetic Products and Non-Food Products intended for Consumers.

No increased response was found by alternating the two irritants (alcohol-based disinfectant and detergent) as compared to application of detergent separately. Furthermore, it was confirmed that alcohol-based disinfectant causes less skin irritation than detergent. It can be concluded that in conventional hand washing, the detergent (soap) can be replaced by an alcohol-based disinfectant when hands are not visibly contaminated, and that alternate use of detergent/alcohol solution should not be recommended against. These findings are important with respect to wet work, and may help prevent development of chronic irritant hand eczema.