

All these above series tested in 10 normal controls were negative. In our patient, allergic contact conjunctivitis and allergic contact dermatitis were caused by thimerosal contained in the lens-cleaning solution and also probably by sodium cromoglycate (cromolyn) present in prescribed eyedrops. For demonstration of this allergy, a mixture of sodium cromoglycate and benzalkonium chloride was necessary for patch testing.

Allergy to cromoglycate has been poorly described and adverse reactions to cromolyn are unusual. Some of them, due to inhalation, are irritant. Nevertheless, angioedema, urticaria and anaphylaxis with eosinophilia have been described. Furthermore, generalized eczema after oral therapy, and acute conjunctival reaction after the use of therapeutic eyedrops, are reported. An immunological basis for respiratory reactions has been not proven. Dermatological effects have been poorly studied (1-6).

In certain cases, patch testing requires subtle variations in the concentration and vehicle of the allergen, to obtain the right conditions, to reach the epidermal antigen-presenting cell (7). In this case, the addition of benzalkonium chloride to cromoglycate was essential ('compound allergy'). Repeated patch tests with 0.1% pet. benzalkonium chloride were negative. A ROAT with the eyedrops and a patch test with sodium cromoglycate 1% plus benzalkonium chloride 0.1% pet. produced strongly positive reactions, suggesting a rôle for cromolyn. A possible in-

hibitory effect of cromoglycate on patch test reactions has also been described (8-10).

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Hydroxylammonium chloride as sensitizer in a water laboratory

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Hydroxylammonium chloride (CAS 5470-11-1), $\text{NH}_2\text{OH} \cdot \text{HCl}$, also called, e.g., hydroxylamine hydrochloride and oxammonium hydrochloride, is a low molecular weight (MW 69.5) crystalline, hygroscopic salt of hydroxylamine which is soluble in water and alcohol. It is slightly or moderately irritating to the skin. The dusts of the salt may also irritate the eyes and the throat. The chemical easily penetrates the skin and can cause methemoglobin formation in the blood (1).

Hydroxylammonium chloride was found to be a sensitizer in guinea pigs at the end of the 1950s, when cases of dermatitis were connected with the substance (2). As a reactive chemical it is extensively used in various branches of industry (1), but reports on human sensitization are still few (3-5).

Case Report

A non-atopic, previously healthy, 32-year-old woman had worked as a laboratory technician in a water laboratory for 13 years. During the past 3 years, she had had worsening hand dermatitis, which had lately also spread to her arms and face. The dermatitis always disappeared even during short sick leaves and holidays. In her job, she handled about 200 chemicals, some of them daily, 15 of which, including potassium dichromate and formaldehyde, were known contact sensitizers. Hydroxylammonium chloride was used as a reagent in determinations of iron and manganese in water. Our patient dissolved up to 200 g chemical powder in water 1× a week to prepare a 10% reagent solution. She handled the solution for 0.5-2 h a day without any gloves, but started to

use disposable plastic gloves after dermatitis had appeared.

Patch tests were performed in 2 sessions, with Finn Chambers® as previously described (6, 7), using: a modified European standard series, a rubber additive series, a cosmetic and medicament series, all from Chemotechnique Diagnostics AB, Sweden, 31 substances or materials from the patient's workplace and 15 of her own cosmetics and toiletries. Hydroxylammonium chloride, tested as 2 dilution series (Table 1), produced repeatedly +++ reactions to 0.2%–0.05% aq. and a ?+ reaction even with 0.0125% aq., but only ?+ reactions with 0.2–0.025% pet. In addition, Amerchol L-101 was ++ and repeatedly also the patient's own skin lotion and a cleansing agent, as is, gave ++ reactions, though the patient had not noted any skin symptoms when using these products.

Despite avoidance of contact with hydroxylammonium chloride, intensified skin protection with disposable gloves and coats, a change of cosmetics and toiletries, and a change of work site, the patient's dermatitis recurred even more strongly than previously during repeated attempts to continue with her work. Consequently, she had to discontinue working in the laboratory.

Discussion

Hydroxylammonium salts are used as stable forms of hydroxylamine, which easily undergo reactions, in the production of surface coatings and pharmaceuticals, e.g., antibiotics and steroids, in photography, and in the rubber, plastics and textile industries (1). Sensitization to hydroxylammonium chloride has been reported in a factory manufacturing the chemical (2), in chemical (3) and photographic laboratories (4), and from the handling of diazo copy paper (5). Based on these reported cases, as well as our own case, it is feasible to regard the chemical as a weak or moderate human sensitizer. A positive dilution series (6, 8) in aq. confirmed water as the best patch test vehicle and 0.1% (–0.05%) as the optimal patch test concentration (2). A 0.1% aq. patch test preparation is available, e.g., from Chemotechnique Diagnostics (Malmö, Sweden). A water laboratory can be an important source of exposure to hydroxylammonium

Table 1. The results of dilution series of hydroxylammonium chloride in aq. and pet.

% aq.	Result	% pet.	Result
0.2	+++	0.2	?+
0.1	+++	0.1	?+
0.05	+++	0.05	?+
0.025	++	0.025	?+
0.0125	?+	0.0125	–

chloride. Material safety data sheets and packages of the chemical should indicate that the substance is a potential contact sensitizer.

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