Natural rubber gloves might not protect against skin penetration of methylisothiazolinone

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Methylisothiazolinone (MI) is now recognized as a frequent sensitizing preservative in cosmetic, household and industrial products. We describe here a sensitized female nurse with severe hand dermatitis notwithstanding the use of natural rubber gloves when handling MI-containing cleansing products. Patch tests were performed with pieces of both natural rubber and nitrile gloves covered with MI 500 ppm to determine whether MI penetrates and causes a positive reaction.

Case Report

A 55-year-old female nurse, with a history of of hay fever, presented in October 2013 with chronic eczematous lesions on both hands of approximately 20 years duration, but with an acute worsening since May 2013 (Fig. 1). Patch tests had been performed by another dermatologist shortly after the lesions had started to develop, which had revealed contact allergy to the mixture of methylchloro- and methylisothiazolinone (MCI/MI) 100ppm aq. Her history further revealed the use of nitrile gloves when handling drugs at work, and household natural rubber gloves to do housework; however, these did not seem to improve the eczematous condition. Furthermore, the patient referred to intolerance when her skin came into contact with potatoes, cucumbers, and tomatoes.

Patch testing was performed in October 2013 with the European baseline series (Trolab, Hermal, Reinbeck,
GLOVE PROTECTION AGAINST METHYLISOTHIAZOLINONE

ESPASANDÍN-ARIAS & GOOSSENS

Contact Points

Contact Dermatitis

Fig. 1. Severe hand dermatitis in the present case.

Table 1. Patch test results

<table>
<thead>
<tr>
<th>Allergen</th>
<th>Result on D2</th>
<th>Result on D4</th>
</tr>
</thead>
<tbody>
<tr>
<td>MI 2000 ppm</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>MI 500 ppm</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>MI + MCI 200 ppm</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>MI + MCI 100 ppm</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Nitrile gloves + MI 500 ppm</td>
<td>−</td>
<td>−</td>
</tr>
<tr>
<td>Rubber gloves + MI 500 ppm</td>
<td>?</td>
<td>+</td>
</tr>
</tbody>
</table>

MCI, methylchloroisothiazolinone; MI, methylisothiazolinone.

Germany), a cosmetic and rubber series (both from Chemotechnique, Vellinge, Sweden), natural rubber and nitrile gloves, and the contacted topical products, along with the known allergens in them. The materials used were IQ Ultra® patch test chambers (Chemotechnique), fixed with Mefix® (Mölnlycke Health Care, Göteborg, Sweden).

The readings were performed after 2 and 4 days, according to the International Contact Dermatitis Research Group criteria, and the results are summarized in Table 1.

As one of the frequently used cleansing products, a dishwashing liquid contained MI, we studied the protective efficacy of both natural rubber gloves (worn at home) and nitrile gloves. For this purpose, the skin of the back was covered with two squares of both gloves larger than the IQ Ultra® patch test chambers. Twenty microlitres of MI 500 ppm was applied with a micropipette onto the IQ Ultra® patch test chambers, and applied over the glove material. After a 2-day occlusion, readings were performed at removal of the patch tests and also at D4 (Table 1; Fig. 2).

A prick-by-prick test was also performed with raw potato, cucumber, and tomato, resulting in positive results (> 1/2 wheal diameter of histamine). A protein contact dermatitis might have facilitated the development of the contact-allergic reaction to MI.

Discussion

During recent years, a dramatic increase in the prevalence of allergic contact dermatitis caused by MI has been observed, and is considered to be an epidemic (1).

Glove protection against allergens can be studied with an in vitro method or an in vivo method using patch testing, the latter being capable of reproducing certain factors that may influence the dermatitis and the protective effect of the gloves, such as occlusion, skin temperature, and humidity. Moreover, advice could be given to the patient suffering from allergic contact dermatitis about the most appropriate protective gloves.

In vivo studies using patch testing with a 48-hour exposure have been used for some photographic chemicals (2), acrylate resin systems (3), and plant allergens, such as daily disulfide, Allium sativum, and α-methylene-γ-butyrolactone. It was concluded that, although the 48-hour exposure time is higher than that in real life, the results provided interesting data on glove permeability (4).

A probably superior method has been proposed (5), using three different exposure times, depending on field studies in the workplace, where the real exposure to the
chemical takes place; this may better mimic the possible exposure in practice.

Although the test method employed here might not be adequate to study glove permeability, it shows that MI can penetrate natural rubber gloves, which, in this case, explains the severity and chronicity of the patient’s dermatitis when daily and repeatedly handling the MI-containing detergent. Moreover, it further shows that nitrile gloves probably offer better protection.

References
5 Andersson T, Bruze M. In vivo testing of the protective efficacy of gloves against allergen-containing products using an open chamber system. Contact Dermatitis 1999; 41: 260–263.