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CONTACT POINT

Occupationally relevant positive patch test reactions in Indonesian batik workers

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Batik is a traditional east-Asian textile printing technique. Artisans are increasingly exposed to synthetic dyes because they are easier and quicker to use than natural (plant-based) dyes.

METHODS

We examined 222 workers employed by 16 small enterprises in the Special Region of Yogyakarta, Indonesia. Of these workers, nine were suspected of having occupation-related allergic contact dermatitis. All nine workers were patch tested with the European baseline series (Chemotechnique Diagnostics, Vellinge, Sweden), a textile series (Chemotechnique Diagnostics), and the following additional allergens relevant to the batik industry: paraffin (molecular weight range: 250–400 Da),1 brown indigosol, soga, and indanthrene in the concentrations and vehicles indicated in Table 1. The patches were covered with Hypafix tape; Vivomed, Northern Ireland, UK and occluded for 48 hours. The results were read at day (D) 3 and D4.

TABLE 1 Patch test results among nine subjects suspected of having occupation-related allergic contact dermatitis

<table>
<thead>
<tr>
<th>Materials to which workers were exposed</th>
<th>Allergen</th>
<th>Concentration tested (% pet.)</th>
<th>Positive patch test a</th>
<th>CAS no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malam wax</td>
<td>Paraffin</td>
<td>30.0</td>
<td>2</td>
<td>8002-74-2</td>
</tr>
<tr>
<td></td>
<td>Colophonium</td>
<td>20.0</td>
<td>2</td>
<td>8050-09-7</td>
</tr>
<tr>
<td>Dyes</td>
<td>Reactive Red 123</td>
<td>1.0</td>
<td>3</td>
<td>68959-17-1</td>
</tr>
<tr>
<td></td>
<td>Reactive Red 228</td>
<td>1.0</td>
<td>1</td>
<td>140876-11-5</td>
</tr>
<tr>
<td></td>
<td>Reactive Red 238</td>
<td>1.0</td>
<td>2</td>
<td>173995-81-8</td>
</tr>
<tr>
<td></td>
<td>Reactive Blue 21</td>
<td>1.0</td>
<td>2</td>
<td>12236-86-1</td>
</tr>
<tr>
<td></td>
<td>Reactive Violet 5</td>
<td>1.0</td>
<td>2</td>
<td>12226-38-9</td>
</tr>
<tr>
<td></td>
<td>Reactive Black 5</td>
<td>1.0</td>
<td>1</td>
<td>17095-24-8</td>
</tr>
<tr>
<td></td>
<td>Brown indigosol</td>
<td>5% pet.</td>
<td>1</td>
<td>4423-36-9</td>
</tr>
<tr>
<td></td>
<td>Soga</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Soga</td>
<td>5</td>
<td>1</td>
<td>-</td>
</tr>
</tbody>
</table>

aPatients may overlap – see Table 2 for details.
following guidelines of the International Contact Dermatitis Research Group.

RESULTS AND DISCUSSION

For a summary of the patch test results see the Tables 1 and 2. Seven out of the nine patch tested workers had a positive reaction to at least one allergen used in the batik industry. The two remaining workers suspected of having occupational allergic contact dermatitis had negative results to all the allergens tested.

Reactive Red 123 was the most frequent relevant sensitizing chemical \( n = 3/7 \). Indigosol (positive in one subject) is a Vat dye; these dyes are water-insoluble and are not common allergens.\(^2\)\(^3\) Soga, a natural brown dye from plants, was positive in one subject.

The natural soga we had patch tested is different from synthetic soga dyes; synthetic soga dyes are naphthol dyes, which are less commonly used in the traditional batik enterprises and have not been patch tested. The main content of soga is tannin.\(^4\)

Malam is a traditional wax that is commonly used in batik processing in Indonesia.\(^5\) The wax is paraffin based and contains a mixture of colophonium, triterpenoid resin, microcrystalline wax, and beeswax. However, our subjects refused to be directly patch-tested using malam wax because they assumed it would precipitate their skin problems. Therefore, instead of patch testing with malam wax as is, we chose to use the paraffin (30%}

### TABLE 2  Workers with occupational allergic contact dermatitis

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age (years)</th>
<th>Work section</th>
<th>Causes of the skin symptoms</th>
<th>Sensitization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>48</td>
<td>Dry work</td>
<td>Malam wax</td>
<td>Colophonium, Reactive Blue 21, paraffin 30%</td>
</tr>
<tr>
<td>Male</td>
<td>35</td>
<td>Dry work</td>
<td>Malam wax</td>
<td>Colophonium</td>
</tr>
<tr>
<td>Male</td>
<td>46</td>
<td>Wet work</td>
<td>Coloring process</td>
<td>Reactive Blue 21, soga 1%, soga 5%</td>
</tr>
<tr>
<td>Male</td>
<td>20</td>
<td>Wet work</td>
<td>Coloring process</td>
<td>Reactive Black 5, Reactive Red 123</td>
</tr>
<tr>
<td>Female</td>
<td>43</td>
<td>Wet work</td>
<td>Coloring process</td>
<td>Brown indigosol 5%</td>
</tr>
<tr>
<td>Male</td>
<td>52</td>
<td>Wet work</td>
<td>Coloring process</td>
<td>Reactive Red 123</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wax removal</td>
<td>Malam wax</td>
<td>Reactive Red 238, Reactive Red 228, Reactive Violet 5</td>
</tr>
<tr>
<td>Male</td>
<td>19</td>
<td>All types of work</td>
<td>Pattern making</td>
<td>Reactive Red 123</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Coloring process</td>
<td>Reactive Red 238</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Wax removal</td>
<td>Reactive Violet 5</td>
</tr>
</tbody>
</table>

**FIGURE 1** Traditional batik workers apply malam wax onto the fabrics before the coloring process
dispersed in pet.) on which the malam is based; this was positive in two subjects. Although unexpected in view of its chemical composition, paraffin as a skin sensitizer was reported in 12 workers exposed to neat cutting oil: serial patch testing showed strong positive reactions to the chlorinated paraffin fraction of the oil. Both the subjects positive to colophonium worked in the stamping process, and were, therefore, in contact with malam wax.

Nickel (II) sulfate, potassium dichromate, and cobalt (II) chloride hexahydrate were positive in some subjects (data not shown). However, those metals are not used in the traditional batik manufacturing process.

In conclusion, our findings show that traditional batik workers might be exposed to several sensitizing materials and, therefore, the appropriate personal protective equipment use is highly recommended (Figure 1).

CONFLICT OF INTERESTS
The authors declare no potential conflicts of interest.

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