



A case of contact dermatitis caused by a polyurethane hot melt adhesive

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Thermoplastic resin is the principal component of hot melt adhesives (HMAs), which are widely used in daily life. We report a case of contact dermatitis caused by an HMA in a uniform name label.

CASE REPORT

A 36-year-old Japanese female presented to our department with rectangular itching erythema on her waist (Figure 1). The

erythema developed on the second day of use of her new nursing uniform at the site where a name label was attached to the uniform. Name labels were glued on the outside of the trousers in the waist area, and on the inside of the jacket, at its back. The patient had a similar reaction to the jacket label. She had never experienced skin reactions to other plastic products or adhesives. Of all the staff, only the patient experienced these skin problems. The label was made of polyester taffeta, and glued to



FIGURE 1 Rectangular erythema with itching at the waist

the garments with an HMA. On the basis of clinical symptoms, contact dermatitis was diagnosed.

Patch testing was performed, by the use of Finn Chambers, with the front and back of the name label, with or without heat treatment. On day (D) 2, all sites where labels had been placed showed ++ positive reactions (Figure 2). Further patch testing was performed with two adhesives used in the HMA: a urethane-based HMA (Dan furs 6150; Nittobo, Osaka, Japan) and an acrylic liquid-type adhesive (G-6964; Sheedom, Osaka, Japan). Urethane-based HMA sheets were applied "as is," and the acrylic adhesive was applied diluted 1:10, 1:100, and 1:1000. On D2, the urethane-based HMA yielded a ++ positive reaction, which continued to be present after 1 week, whereas no reactions were observed to the acrylic liquid adhesive at any dilution. Gas chromatography-mass spectrometry was performed for ingredient analysis to identify

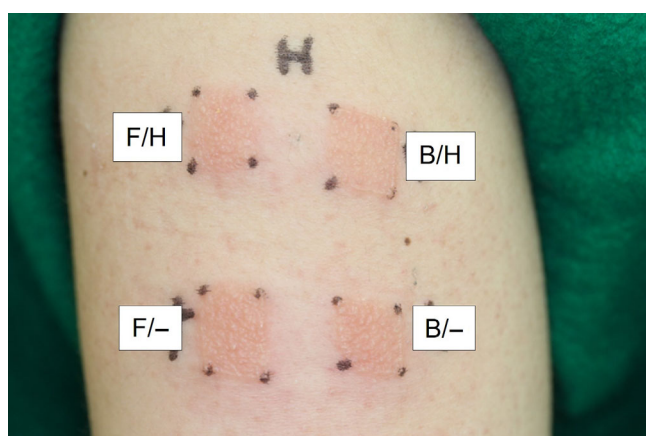


FIGURE 2 Patch testing with the front and back parts of the name label, with or without heat treatment (135°C). On day 2, all tests sites showed ++ positive reactions according to the ICDRG criteria. B/–, back of the name label, without heat treatment; B/H, back of the name label, with heat treatment; F/–, front of the name label, without heat treatment; F/H, front of the name label, with heat treatment

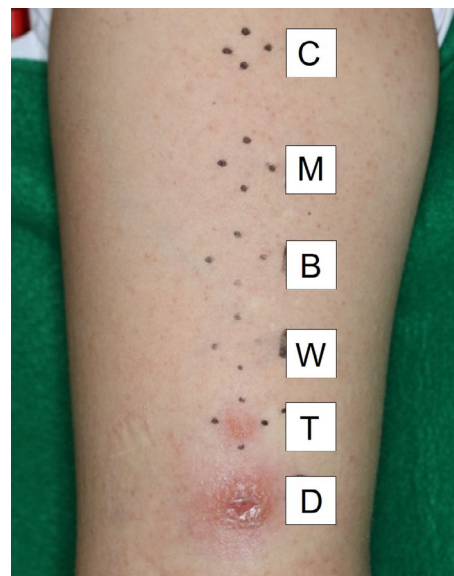


FIGURE 3 Patch tests were performed with five substances identified in the chemical analyses of the hot melt adhesive. One week later, papules remained in the same area. The photograph was taken on day (D) 3. Dimethyl (*p*-methoxybenzylidene)malonate gave a positive reaction on day (D) 2. On D3, the photostabilizer Tinuvin 770 also caused the development of papules. C, control (vaseline); M, diphenylmethane 4,4'-diisocyanate (1% pet.); B, BHT, ie 2,6-di-*tert*-butyl-*p*-cresol (2% pet.); W, adipate polyplasticizer W-220-EL (5% pet.); T, Tinuvin 770 (5% pet.), +; D, dimethyl (*p*-methoxybenzylidene) malonate (2% pet.), +++

the causative agent, and showed five substances, namely: methylenediphenyl 4,4'-diisocyanate (MDI), CAS no. 101-68-8 (Tokyo Chemical Industry, Tokyo, Japan); 2,6-di-*tert*-butyl-*p*-cresol (BHT), CAS no. 128-37-0 (Tokyo Chemical Industry); adipate polyplasticizer W-220-EL (DIC Corporation, Tokyo, Japan); bis(2,2,6,6-tetramethyl-4-piperidyl) sebacate (Tinuvin 770), CAS no. 52829-07-9 (Tokyo Chemical Industry); and dimethyl (*p*-methoxybenzylidene)malonate (DMBM), CAS no. 7443-25-6 (Clariant K.K., Tokyo, Japan).

Further patch testing was conducted, and positive reactions were found to Tinuvin 770, which is a light stabilizer, and DMBM, which is an ultraviolet-absorbing agent (Figure 3).

DISCUSSION

Contact dermatitis caused by polyurethane is often caused by hardeners such as diisocyanates, for example, diphenylmethane-4,4'-diisocyanate and toluene-2,4-diisocyanate.¹ In this case, contact allergy was caused by DMBM, which is an ultraviolet light absorber, and Tinuvin 770, which is a light stabilizer contained in HMAs. Although contact dermatitis caused by polysilicone-15, similarly to DMBM and Tinuvin 770, has been reported,^{2,3} dermatitis caused by DMBM has not been reported. Although HMAs are easy to use in daily life, it is necessary to be aware of the risk of allergic contact dermatitis.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to report.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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Online supplement:

Chemical analysis

1) Extraction method: The HMA was placed in 1.5 g in a screw cap glass vial, and 10 mL of chloroform (Kanto Chemical, Tokyo, Japan) was added to perform ultrasonic extraction for 10 minutes. 2) Component Analysis Method: (Gas Chromatography Mass Spectrometry (GC/MS)):

Separation of components in the samples was performed with an Agilent 6890 gas-chromatograph (Agilent Technologies, Palo Alto, California) equipped with an InertCap-5MS/Sil capillary column (GL Sciences, Tokyo, Japan) with a length of 30 m, an internal diameter of 0.25 mm, and a film thickness of 0.25 μm . Helium was the carrier gas, with a flow rate of 1.5 mL/min. The injection was a splitless injection, and the inlet was heated to 280 °C. The injection volume was 1 μL . The temperature program was isothermal at 50 °C for 5 min, an increase at 10 °C/min to final temperature of 320 °C, and maintenance at this isothermal temperature for 10 min. The gas chromatograph was connected to a JEOL JMS-700 MStation mass spectrometer (JEOL, Tokyo, Japan). Electron ionization (EI) mass spectra were recorded with m/z from 50 to 800 (scan mode), with a scan duration of 0.92 seconds and an interscan delay of 0.48 seconds. The temperature of the ion source was 280 °C, and the GC/MS interface temperature was 280 °C. The electron energy was 75 eV. The National Institute of Standard and Technology (NIST; Gaithersburg, Maryland) library of mass spectra was used for identification.