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Allergic contact dermatitis caused by Solvent Orange 60 in spectacle frames in Japan

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Solvent Orange 60 (SO 60) is a perinone-type oil-soluble plastic dye, and may cause allergic contact dermatitis when used in spectacle frames. In 1999, we reported the first male case, who had a strong positive patch test reaction to SO 60 1% pet. (1, 2). We since continued to patch test SO 60 in patients with suspected spectacle frame dermatitis, and encountered 4 female patients with positive reactions between 2009 and 2016, the latest of whom is presented here.

Case Report

A 45-year-old female developed itchy infiltrative erythematous peri-auricular dermatitis 6 weeks after she started to wear new reddish-brown plastic spectacle frames 'made in Japan'. The dermatitis spread to the upper part of the bilateral pinna. Patch tests were performed in March 2016 with Finn Chambers® (SmartPractice, Phoenix, AZ, USA) on Scanpor tape® (Norgesplaster, Vennesla, Norway) on the patient's lateral upper arm. A reading was performed on day (D) 3 according to ICDRG criteria. SO 60 (Arimoto Chemical, Osaka, Japan) and Solvent Red 179 (SR 179) (KIWA Chemical Industry, Wakayama, Japan) were both diluted 1%, 0.1%, 0.01% and 0.001% pet., and tested along with scrapings of the plastic frame touching the ears. The patient had +++ reactions to the scrapings of the temple and to SO 60 1% down to 0.001% pet. (Fig. 1), and also a + reaction to SR 179 1% pet. Ten controls had negative results with both dyes tested at 1% pet.

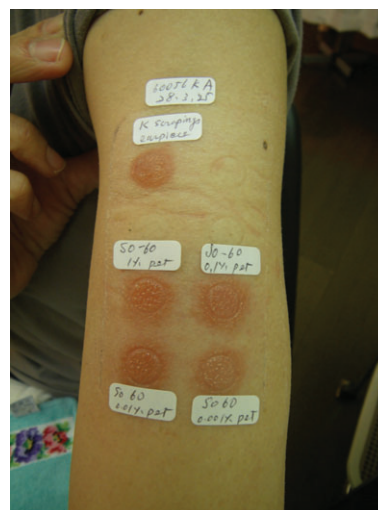


Fig. 1. Scrapings of the plastic temple of the spectacle frames and Solvent Orange 60 1.0–0.001% pet. elicited +++ vesicular reactions. Solvent Red 179 (SR 179) 1% pet. elicited a + reaction on D3.

Upon inquiry, the producer in Sabae, Japan stated that the causative spectacle frames were produced by use of a plastic plate made by a Hong Kong company, and that only the final assembly had been performed in Sabae. The Hong Kong company denied the presence of SO 60 in the respective plastic plate. Therefore, gas chromatography/mass spectrometry was performed on an extract from the piece of the frames, and detected the following nine chemicals: SO 60; red dye of unknown chemical structure (different from SR 179); diethyl phthalate; diisooctyl phthalate; bis(2-ethylhexyl) adipate; tri(ethylene glycol) di-2-ethylhexanoate; 2,4-di-*tert*-butylphenol;

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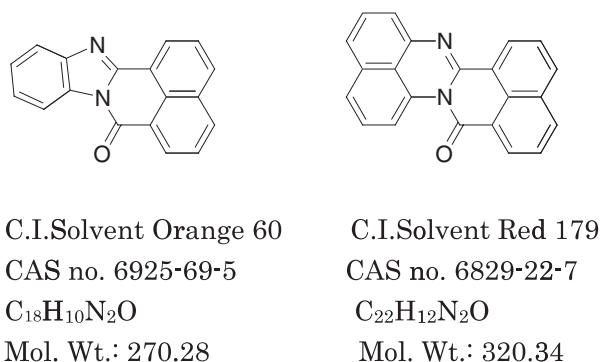


Fig. 2. Structural formulae of Solvent Orange 60 and Solvent Red 179. Mol. Wt., molecular weight.

2-ethylhexyl 4-methoxycinnamate; and triphenyl phosphate. Further patch testing with the above eight chemicals other than SO 60 gave negative results.

Upon a second inquiry, the Hong Kong-based producer did admit the presence of SO 60. The spectacle producer decided to abandon the use of SO 60 and SR 179 in all spectacle frames in the future, and withdrew those containing SO 60 and SR 179 from the shops.

Discussion

After our first publication, 7 other Japanese male cases of spectacle earpiece dermatitis were reported until 2004 (3, 4), and, since 2006, another 6 cases of

allergic contact dermatitis have been reported from Scandinavia, affecting spectacle and goggle users, and plastic factory workers (5, 6). In most of the reported cases, SO 60 caused very strong patch test reactions. SO 60 may cross-react with SR 179 (Fig. 2), another perinone-type plastic dye. This was shown by Tsunoda et al. (7), who reported a case of contact spectacle earpiece dermatitis caused by SR 179 with cross-reaction to SO 60.

Sabae City produces 95% of Japanese spectacle frames, but its sales decreased because cheaper Chinese or Korean spectacle frames became popular, and today some of the Japanese spectacles are made by the use of foreign plastic plates. Among 12 reported Japanese cases of contact allergy to SO 60, including our 4 new cases, we could trace four causative earpieces that were made in Japan (1, 3), two that were made in China, and one that was made in Korea (4); also, the causative dyes used in one of the Japanese earpieces had been imported from China (3). Two causative plastic spectacle frames were made in China, with Chinese plastic plates.

Today, plastic spectacle frames seem to be more popular than metal frames; therefore, the frequency of contact allergy to SO 60 may increase, and it should thus be patch tested in suspected cases. The availability of a commercial patch test allergen would be helpful, and patch test concentrations should be <1% (0.1% at most) pet. Also, SR 179 should be patch tested simultaneously to examine cross-reactivity.

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