

Sensitivity to Multiple Benzophenone Sunscreen Agents

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PRECIS

Herein, we report 2 cases of contact allergy to sunscreen chemicals, including multiple benzophenones.

DISCUSSION

Case 1 was a 28-year-old healthy man of Asian descent who presented with a 3- to 4-year history of intensely pruritic, photo-distributed blistering dermatitis that developed after episodic application of sunscreen during warm weather vacations. The patient was patch tested to the North American Contact Dermatitis Group screening series in addition to the photo allergen series. He was also photopatch tested to a personal sunscreen product (Coppertone Sport Sunscreen). Minimal erythema dose testing showed normal sensitivity to UVA (>15 J) and UVB (>120 mJ) for Fitzpatrick skin type IV. At 24 hours, 1 set of allergens was irradiated with 10 J/cm^2 of UVA. Both sets were read at 24 hours and then covered except for subsequent readings at 48 and 96 hours. Final results are summarized in Table 1. Strength of reactions between irradiated and nonirradiated sides were equal (Fig. 1), signifying allergic contact dermatitis (ACD) to several different sunscreen chemicals, but no photoallergic contact dermatitis. Benzophenone-3 was present in the Coppertone Sport Sunscreen, confirming relevance of this reaction.

Case 2 was a 31-year-old woman with a 3-year history of lip dermatitis. Patch testing revealed positive (+) reactions to benzophenone-3 and benzophenone-8 (Table 1, Fig. 2), but not to other sunscreen chemicals. Benzophenone-3 was identified in several of her lip balms; no source was identified for benzophenone-8 exposure.

Benzophenones are a large class of chemical ultraviolet light absorbers that were named Contact Allergen of the Year by the American Contact Dermatitis Society in 2014.¹ This group of chemicals is found not only in sunscreen products but is widely used in both cosmetics (eg, shampoos, moisturizers) and industrial

products (eg, paints, varnishes) to prevent photodegradation. In our clinic, we have found that approximately a third of lip ACD in our patients is due to sunscreen agents (much higher than 5%–7.4% in published studies²) and we now routinely test the sunscreen series in all of our patients with lip dermatitis. According to North American Contact Dermatitis Group data from 2001 to 2010, sunscreen chemicals as a whole are only responsible for approximately 0.9% of allergic contact dermatitis in patients referred for patch testing. However, of sunscreen allergy, benzophenone-3 is the responsible allergen in 70.2% of cases.³

Although benzophenone-3 and benzophenone-4 comprise most benzophenones used in personal care products, there are few reports of other benzophenones as the cause of ACD. Sensitivity to benzophenone-2 and benzophenone-8 is exceedingly rare¹ with only 1 other reported case to benzophenone-2⁴ and 2 cases to benzophenone-8.¹ Cross-reactivity between benzophenones is conceivable given their shared chemical structure (Fig. 3) but has not been well documented in the literature. A report from Sasseville et al⁵ describes possible cross-reactivity between benzophenone-3, benzophenone-4, and benzophenone-8 but suggests that structural differences of benzophenone-2, specifically hydroxyl substitutions at positions 2' and 4', may prevent recognition by antigen presenting cells and thus limit cross-reactivity with other benzophenones. The results from these 2 cases support this hypothesis.

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ACD to multiple different benzophenones is exceedingly rare and further validates potential cross-reactivity within this class of sunscreen chemicals.

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The authors have no funding or conflicts of interest to declare.

The contents of this publication do not represent the views of the Department of Veterans Affairs or the United States Government.

DOI: 10.1097/DER.0000000000000131

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TABLE 1. Summary of Patch Test Reactions to Sunscreen Chemicals

	Patient 1	Patient 2
Sunscreen chemicals		
Benzophenone-2	—	—
Benzophenone-3	++/+++	+
Benzophenone-4	+	—
Benzophenone-8	+++	+
Benzophenone-10	++	—
Octyl dimethyl PABA	++	—
Ethyl hexyl-4-methoxycinnamate	++	—
Ethyl hexyl dimethyl PABA	++	—
Isoamyl-4-methoxycinnamate	+/-	—
Personal products		
Coppertone Sport Sunscreen	+++	N/A
Blistex 5 Star Lip Protection	N/A	+
Chapstick Original Lip Balm	N/A	+

N/A indicates not applicable.

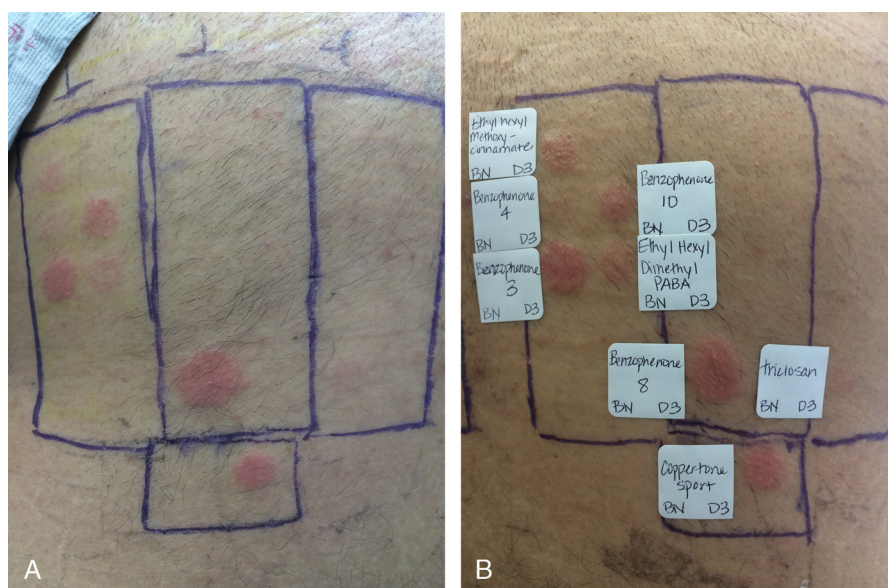


Figure 1. Photopatch test results on day 3. Reactions are equal and congruent between irradiated and nonirradiated sides. A, Irradiated side. B, Nonirradiated side.

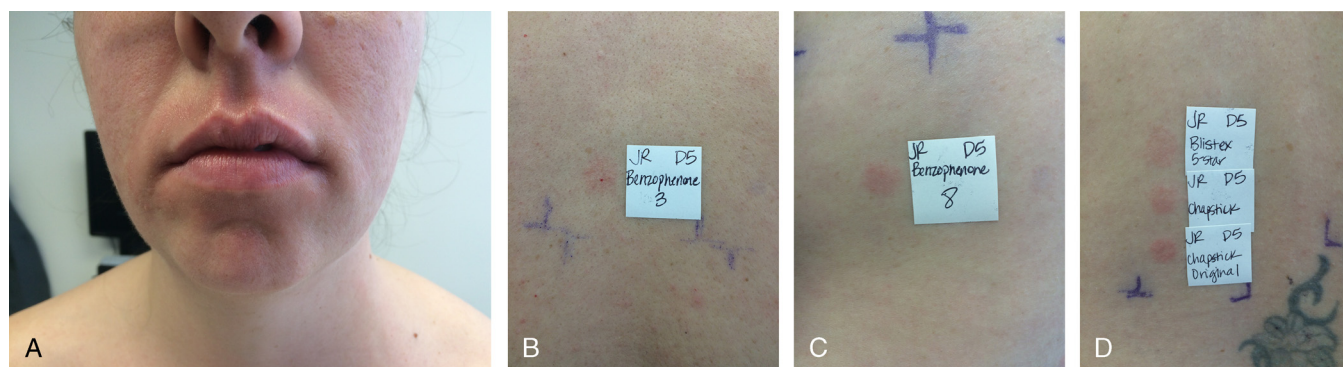


Figure 2. A, Pink eczematous dermatitis of the lips and surrounding perioral skin. B, Positive (+) reaction to benzophenone-3. C, Positive (+) reaction to benzophenone-8. D, Several positive (+) reactions to personal lip balms containing benzophenone-3.

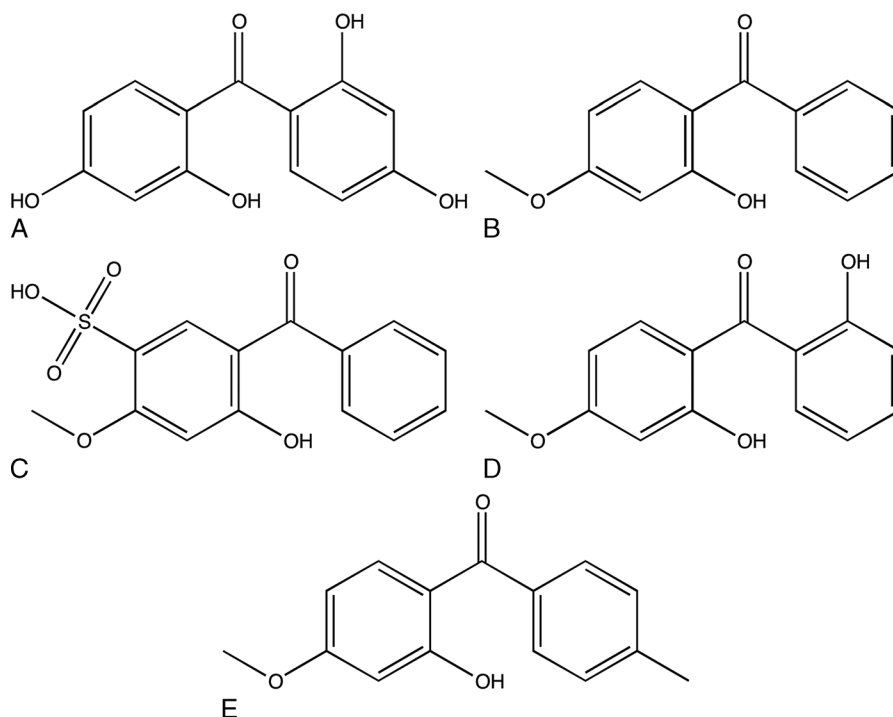


Figure 3. Chemical structures of benzophenones. A, Benzophenone-2. B, Benzophenone-3. C, Benzophenone-4. D, Benzophenone-8. E, Benzophenone-10.