

# Allergic Contact Dermatitis From Sorbitans in Beer and Bread

Katharine Saussy, MD; Megan Couvillion, MD, MS; Katherine Holcomb, MD

## PRACTICE POINTS

- Sorbitan sesquioleate (SSO) and sorbitan monooleate (SMO) are increasingly relevant contact allergens that may be present in yeast-fermented and leavened products.
- When patch testing is positive to SSO and SMO, the dermatologist should inquire about dietary habits with specific attention to beer and bread.
- Consider elimination of beer, bread, and other leavened products when rash persists after avoidance of topical exposures.

Sorbitol-derived compounds have been increasingly recognized as a cause of delayed hypersensitivity reactions. We present a case of recurrent allergic contact dermatitis (ACD) that lasted 6 months in which the patient retrospectively correlated new lesion appearance with consumption of specific types of beer and bread. Patch testing using the North American Contact Dermatitis Group Standard Series with supplemental allergens was positive for sorbitan sesquioleate (SSO) and sorbitan monooleate (SMO). Avoidance of beer and bread led to complete clinical resolution. Sorbitol in beer and bread is not well documented but likely is related to the yeast cultures used for fermentation and leavening. Sorbitol is utilized as an osmotic stabilizer in yeast culture preparation and is found in commercially prepared brewer's and baker's yeasts. We propose that trace amounts of sorbitans in yeast-containing products can cause ACD. Systematized ACD poses a challenge for dermatologists to diagnose, as the pattern can be nonspecific and skin testing does not always produce meaningful results. Because it is difficult to elicit history and correlate exposures with worsening of skin symptoms, a trial of dietary avoidance may be necessary to determine the diagnosis of systematized ACD. When patch testing is positive for SSO and SMO, the dermatologist should inquire about dietary habits with attention to beer and bread.

*Cutis.* 2019;104:184-186.

**S**orbitan sesquioleate (SSO), sorbitan monooleate (SMO), and related compounds are increasingly recognized contact allergens. Sorbitan sesquioleate

and SMO are nonionic emulsifying agents derived from sorbitol.<sup>1</sup>

Sorbitan sesquioleate, SMO, and other sorbitol derivatives are used as emulsifiers and dispersing agents in cosmetics, topical medications, topical emollients, produce, and other commercial products. Related compounds also are found in foods such as apples, berries, cherries, and sucrose-free cakes and cookies.<sup>1</sup> We present a case of allergic contact dermatitis (ACD) with positive patch testing to sorbitans and clinical correlation with beer and bread exposure.

## Case Report

A 62-year-old man presented with a persistent pruritic rash of 6 months' duration. Erythematous eczematous papules and plaques were observed on the face, neck, chest, abdomen, back, and upper and lower extremities, affecting approximately 60% of the body surface area. His current list of medications was reviewed and included a multivitamin, fish oil, and vitamin C. A punch biopsy revealed spongiotic dermatitis with eosinophils. Patch testing using the North American Contact Dermatitis Group Standard Series with supplemental allergens found in toiletries revealed a positive reaction to SSO and SMO that was persistent at 48 and 96 hours. Notably, patch testing for sodium benzoate, nickel, potassium dichromate, and balsam of Peru were negative. Investigation into the personal care products the patient used identified the presence of sorbitol solution in Vanicream bar soap and Vanicream moisturizing cream (Pharmaceutical Specialties Inc). These products were started after the development of the rash and were discontinued after positive patch testing, but the patient continued to experience the eruption with no improvement.

Retrospectively, the patient was able to correlate exacerbations with drinking beer and eating sandwiches. He habitually ate a sandwich on the same type of bread every single day and enjoyed the same brand of beer 2 to 4 times per week without much variation. To limit allergens,

Dr. Saussy is from the Department of Dermatology, Tulane University, New Orleans, Louisiana. Dr. Couvillion is from Suzanne Bruce and Associates, The Center for Skin Research, Houston, Texas. Dr. Holcomb is from Pure Dermatology, Metairie, Louisiana.

The authors report no conflict of interest.

This case was presented in part at the American Academy of Dermatology 75th Annual Meeting; March 3-7, 2017; Orlando, Florida.

Correspondence: Megan Couvillion, MD, MS, Suzanne Bruce and Associates, The Center for Skin Research, 1900 Saint James Pl, Ste 650, Houston, TX 77056 (mcouvillion@sba-skincare.com).

the patient gave up the daily sandwich and avoided bread altogether, noting remarkable clinical improvement over a few weeks. Later, he described even more improvement while on a trip where he did not have access to his usual beer. The eruption recurred when he returned home and excessively indulged in his favorite beer. He also noted recurrence with exposure to certain breads. No new lesions developed with avoidance of beer and bread, and he had less than 1% body surface area involvement at 2-month follow-up and 0% involvement at 1 year. For educational purposes, follow-up patch testing was performed using Vanicream sorbitol solution and the specific beer and bread the patient consumed. The Vanicream solution was obtained from the manufacturer. The beer was placed directly onto a test disc. The bread was moistened with a drop of saline and then placed directly onto a test disc. All were negative at 48 and 96 hours.

### Comment

**Sorbitol Ingredients**—We report a case of systemic ACD with a positive patch test to sorbitans that was exacerbated with consumption of beer and bread and resolved with avoidance of these products. Although it was determined that the patient used personal care products containing a sorbitol solution, discontinuation did not result in clinical improvement. Sorbitol, sorbitans, and sorbitol derivatives are not commonly reported in the ingredient lists of foods such as beer and bread. Both beer and bread are created with the addition of yeast cultures, for fermentation in beer and for leavening in bread. Sorbitol is used as an osmotic stabilizer in the preparation of yeast strains<sup>2</sup> and also is a by-product of fermentation by certain bacteria<sup>3</sup> found in beer. Additionally, review of commercially available preparations of baker's and brewer's yeasts, such as Fleischmann's and Red Star, list sorbitan monostearate in the ingredients.<sup>4-7</sup> We propose that trace amounts are present in the yeast preparations for brewing and baking.

In this case, the offending beer and bread were locally made products (Abita Beer, Covington, Louisiana; Leidenheimer Bread, New Orleans, Louisiana). Both companies were unable to share their yeast sources, limiting our ability to confirm the use of sorbitol in their preparation. We hypothesize that if sorbitol is commonly used in yeast culture preparation and can be a by-product of fermentation, then it is present in trace amounts in many beers and breads and is not specific to these two products.

**Contact Allergy**—There are few prior reports of ACD due to beer. A case series in 1969 described 4 patients with positive patch testing to ethanol and alcohol by-products and clinical resolution with avoidance of alcohol.<sup>8</sup> Another case from 1985 described ACD to beer where patch testing was positive to the beer itself.<sup>9</sup> Other published cases of cutaneous reactions to beer demonstrated immediate-type hypersensitivity resulting from both ingestion and skin contact, which is thought to be caused by IgE antibodies to malt and barley proteins.<sup>10,11</sup>

It is important to distinguish between systemic ACD and oral allergy syndrome (OAS). Although the defining

features and criteria for diagnosing OAS have not been officially established, OAS is an IgE-mediated immune reaction commonly described as itching, tingling, or swelling, usually confined to the oral cavity after recent consumption of foods such as raw fruits, vegetables, and nuts.<sup>12</sup> Oral allergy syndrome is treated with antihistamines and avoidance of known food allergens. In comparison, ACD is a type IV hypersensitivity, delayed cell-mediated reaction, commonly presenting with widespread rash.

Occupational contact dermatitis is common in bakers and food handlers and is more often irritant than allergic. Several relevant allergens have been identified in these groups<sup>13,14</sup> and do not include sorbitans; our patient tested positive to both SSO and SMO. Sorbitan sesquioleate and SMO have been increasingly recognized as contact allergens over the last several years, both as standalone allergens and as potential cross-reactors.<sup>1</sup> Sorbitan sesquioleate, SMO, and other sorbitol derivatives are found in cosmetics, topical and oral medications, topical emollients, produce, and other commercial products, including but not limited to topical clindamycin, topical metronidazole, topical ketoconazole, tazarotene cream 0.05% and 0.1%, toothpastes, acetaminophen maximum strength liquid, apples, berries, and sucrose-free cakes and cookies.<sup>1,15,16</sup>

In 2014, a study evaluated 12 oral antihistamines as potential sources for systemic contact allergens; 55% of these 12 oral antihistamine preparations included at least 1 of 10 allergen groups specifically identified. The sorbitans and sorbitol derivatives group ranked highest among the group of allergens found listed in these oral medications.<sup>17</sup>

Most patients found to have a contact allergy to the products containing SSO, SMO, or sorbitol derivatives reported notable improvement with discontinuation and change to sorbitol-free product use.<sup>1,18</sup> It should be noted that SSO is added as an emulsifier to many of the fragrances used for patch testing. A positive patch test to fragrance mix without concomitant sorbitan testing may incorrectly diagnose the allergen.<sup>19</sup>

Patients with atopic dermatitis, particularly those with a filaggrin mutation, are at increased risk for ACD to sorbitans due to a compromised skin barrier and frequent use of topical steroids. In one study, 75% of patients (n=12) with a positive patch test to SSO were using a topical steroid emulsified with sorbitol or sorbitan derivatives.<sup>19</sup>

### Conclusion

Sorbitan sesquioleate and SMO are increasingly relevant contact allergens. Sorbitol and related substances have been identified in numerous products and may be present in yeast-fermented and leavened goods. When patch testing is positive to SSO and SMO, the dermatologist should inquire about dietary habits with specific attention to beer and bread, in addition to inventorying other dietary preferences, prescription and over-the-counter medications, and personal care products. We suggest dietary considerations only if topical exposures have been eliminated and the rash has not improved.

## REFERENCES

1. Asarch A, Scheinman PL. Sorbitan sesquioleate: an emerging contact allergen. *Dermatitis*. 2008;19:339-341.
2. Lundblad V, Struhl K. Yeast. In: Adelman K, Ausubel F, Brent R, et al. *Current Protocols in Molecular Biology, Supplement 64*. New York, NY: John Wiley & Sons, Inc; 2008:13.0.1-13.0.4. <https://onlinelibrary.wiley.com>. Accessed August 19, 2019.
3. Spitaels F, Wieme A, Balzarini T, et al. *Gluconobacter cerevisiae* sp. nov., isolated from the brewery environment. *Int J Sys Evol Microbiol*. 2014; 64(pt 4):1134-1141.
4. Fleischmann's, n.d. Product Label for Rapid Rise Instant Yeast. Memphis, TN. 2017.
5. Fleischmann's, n.d. Product Label for Active Dry Yeast. Memphis, TN. 2017.
6. Red Star, n.d. Product Label for Quick-Rise. Milwaukee, WI. 2017.
7. Red Star, n.d. Product Label for Platinum Superior Baking Yeast. Milwaukee, WI. 2017.
8. Fregert S, Groth O, Hjorth N, et al. Alcohol dermatitis. *Acta Derm Venereol*. 1969;49:493-497.
9. Clarke P. Contact dermatitis due to beer. *Med J Aust*. 1985;143:92.
10. Koelmij J, Van Zuuren EJ. Contact urticaria from beer. *Clin Exp Dermatol*. 2014;39:395-407.
11. Santucci B, Cristaudo A, Cannistraci C, et al. Urticaria from beer in 3 patients. *Contact Dermatitis*. 1996;34:368.
12. Kohn JB. What is oral allergy syndrome? *J Acad Nutr Diet*. 2017;117:988.
13. Vincenzi C, Stinchi C, Ricci C, et al. Contact dermatitis due to an emulsifying agent in a baker. *Contact Dermatitis*. 1995;32:57.
14. Nethercott JR, Holness DL. Occupational dermatitis in food handlers and bakers. *J Am Acad Dermatol*. 1989;21:485-490.
15. Pereira F, Cunha H, Dias M. Contact dermatitis due to emulsifiers. *Contact Dermatitis*. 1997;36:114.
16. Gao Z, Maurousset L, Lemoine R, et al. Cloning, expression, and characterization of sorbitol transporters from developing sour cherry fruit and leaf sink tissues. *Plant Physiol*. 2003;131:1566-1575.
17. McEney-Stonelake M, Silvestri DL. Contact allergens in oral antihistamines. *Dermatitis*. 2014;25:83-88.
18. Asarch A, Scheinman PL. Sorbitan sesquioleate, a common emulsifier in topical steroids, is an important contact allergen. *Dermatitis*. 2008; 19:323-327.
19. Hald M, Menné T, Johansen JD, et al. Allergic contact dermatitis caused by sorbitan sesquioleate imitating severe glove dermatitis in a patient with filaggrin mutation. *Contact Dermatitis*. 2013;69:311-322.