

Spa Contact Dermatitis

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Potassium monopersulfate (MPS) is widely used in spa and pool “shock” treatments, yet contact dermatitis associated with MPS has been rarely reported. A patient presented with a generalized scattered dermatitis from the neck down that worsened after spa use. Patch testing elicited a ++ reaction to ammonium persulfate. Contact with ammonium persulfate was ruled out; however, MPS, which can cross-react with ammonium persulfate, was found to be the active ingredient in the patient’s spa shock treatments. The dermatitis cleared after the patient switched to a hydrogen peroxide-based shock treatment.

Case Report

A 45-year-old male presented with a 1-year history of generalized scattered dermatitis. The dermatitis appeared as red papules and patches on the trunk and extremities. No lesions were present above the neck line. Standardized patch testing with Finn Chambers (Epitest Ltd Oy, Tuusula, Finland) and Scanpor tape (Norgesplaster A/S, Vennesla, Norway) with the North American Contact Dermatitis Group Standard Tray and 35 supplemental allergens (Chemotechnique Diagnostics AB, Malmö, Sweden) revealed a ++ reaction to ammonium persulfate 2.5% in petrolatum. Upon extensive elicitation of daily habits, the patient noted that his dermatitis flared with the use of his hot tub. It was discovered that potassium monopersulfate was used in the “shock” treatments for his spa. The patient switched his spa’s shock treatments to a hydrogen peroxide-based treatment (SoftSoak, SpaGuard, USA), and his dermatitis cleared.

Discussion

Potassium monopersulfate (potassium peroxymonosulfate) in the form of the triple salt $2\text{KHSO}_5 \cdot \text{KHSO}_4 \cdot \text{K}_2\text{SO}_4$ (potassium persulfate, potassium sulfate, and potassium bisulfate)¹ is a strong oxidizing agent that is widely used in pool and spa shock treatments. Pools and spas use a two-part sanitization process consisting of daily sanitization and periodic shock treatments. Daily sanitization is used to kill pathogenic organisms and usually is

done via a chlorine or bromine donor, most often in the form of bromochlorodimethylhydantoin (BCDMH). However, sanitization chemicals alone can not adequately prevent the buildup of organic contaminants and subsequent algae growth. Therefore, periodic shock treatments are used to oxidize and thereby eliminate organic contaminants. Shock treatments also help to maintain a proper level of sanitizer by oxidizing the chloramines or bromamines back to the active sanitizing forms (hypochlorous acid or hypobromous acid). Although shock treatments can be chlorine based, they are more frequently nonchlorine based, usually with potassium monopersulfate as the active ingredient.

To our knowledge, there has been only one previously published report of potassium monopersulfate spa-linked contact dermatitis.² However, unlike our patient, the patient in that study did not exhibit a positive reaction to ammonium persulfate. Potassium monopersulfate also was reported to have caused dermatitis in a sheep farmer who did have a positive patch-test reaction to ammonium persulfate.³

Potassium monopersulfate is commonly confused with its disulfate form, potassium persulfate (potassium peroxydisulfate) ($\text{K}_2\text{S}_2\text{O}_8$). Potassium persulfate is commonly used in hair-bleaching and hair-coloring preparations; its presence in these has been reported to cause urticaria,⁴ contact dermatitis, and asthma.⁵ Potassium persulfate also has caused contact dermatitis in a water quality laboratory technician⁶ and a potato flour factory worker⁷ and allergic contact cheilitis from its use in a denture cleanser.⁸

We conclude that potassium monopersulfate was the cause of our patient’s generalized dermatitis. This conclusion is supported by the positive ammonium persulfate patch-test reaction, which was most likely a cross-reaction. The patient denied any hair bleaching, and contact with

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ammonium persulfate from other sources such as kitty litter (in which ammonium persulfate may be used to increase the sorption capacity of the smectite clays used in the litter) or bagpipe drying material (in which ammonium persulfate may be used as a catalyst to form an anticorrosion protective coat for steel objects) was ruled out. Chlorine-based shock treatments or alternative nonchlorine-based shock treatments, such as hydrogen peroxide (eg, SoftSoak), are recommended for patients allergic to potassium monopersulfate. Allergic contact dermatitis from other pool sanitation treatments, such as BCDMH, has been reported⁹⁻¹¹ and must also be considered when presented with spa-related dermatitis.

References

1. Comyns AE. Peroxides and compounds. In: Kroschwitz J, Howe-Grant M, editors. *Kirk-Othmer encyclopedia of chemical technology*, 4th ed. New York: Wiley Interscience; 1996;18:216.
2. Kagen HH, Wolf J, Scheman A, Nedorost S. Potassium peroxy monosulfate-induced contact dermatitis. *Contact Dermatitis* 2004; 51:89-90.
3. Wallengren J, Bergendorff O. Potassium peroxy monosulfate-induced dermatitis in a sheep farmer. *Contact Dermatitis* 1999;41: 299-300.
4. Estrada Rodríguez JL, Gozalo Reques F, Cechini Fernandez C, Rodríguez Prieto MA. Contact urticaria to potassium persulfate. *Contact Dermatitis* 2001;45:177.
5. Pang S, Fiume MZ. Final report on the safety assessment of ammonium, potassium and sodium persulfate. *Int J Toxicol* 2001; 20:7-21.
6. Kanerva L, Alanko K, Jolanki R, et al. Occupational allergic contact dermatitis from potassium persulfate. *Contact Dermatitis* 1999;40: 116-7.
7. Veien N, Hattel T, Laurberg G. Contact dermatitis due to potassium persulfate. *Contact Dermatitis* 2001;45:176.
8. Le Coz CJ, Bezard M. Allergic contact cheilitis due to effervescent dental cleanser: combined responsibilities of the allergen persulfate and prosthesis porosity. *Contact Dermatitis* 1999;41:268-71.
9. Fitzgerald DA, Wilkinson SM, Bhaggoe R, et al. Spa pool dermatitis. *Contact Dermatitis* 1995;33:53.
10. Rycroft RJ. Dermatoses associated with brominated swimming pools. *BMJ* 1983;287:462.
11. Sasseeville D, Moreau L. Contact allergy to 1-bromo-3-chloro-5,5-dimethylhydantoin in spa water. *Contact Dermatitis* 2004;50: 323-4.