

BRIEF REPORT

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Shock Treatment: Swimming Pool Contact Dermatitis

Abstract: Allergic contact dermatitis to potassium peroxymonosulfate, used as a chemical shock treatment for hot tubs and swimming pools, should be in the differential diagnosis for patients presenting with dermatitis triggered by swimming pool or hot tub exposure. We report the first pediatric case of allergic contact dermatitis to potassium peroxymonosulfate after swimming exposure.

Allergic contact dermatitis to various water treatments used in the maintenance of swimming pools and hot tubs has been reported. It has been reported to occur after exposure to chlorine and bromine (1-bromo-3-chloro-5,5 dimethylhydantoin); to sodium metabisulfite, an agent used to lower the pH of swimming pools; and more recently to water treated with potassium peroxymonosulfate, an oxidizing agent used to “shock” hot tubs and swimming pools.

CASE REPORT

An 11-year-old boy presented to the pediatric dermatology clinic for evaluation of a pruritic and eczematous eruption over the trunk and extremities that had been occurring periodically for 4 years. The child and his family related the eruptions to swimming in certain indoor and outdoor pools and to the water park that his family visited each summer. Approximately 1 to 2 hours after swimming he would develop patchy erythema and pruritus. Twelve hours later his reactions would become more severe, with grouped erythematous macules and papules over the trunk and extremities. These eruptions lasted 5 to 10 days and would resolve with application of hydrocortisone 2.5% cream or pimecrolimus 1% cream. They did not occur after swimming in fresh water, salt water, or other pools he frequented. He did not apply sunscreen or other topical agents before any of these eruptions.

He denied shortness of breath or wheezing upon or after exposure to the pools. He had a history of mild atopic dermatitis, controlled with emollients, and seasonal allergic rhinitis.

Because his reactions occurred after only 12 hours, it was not clear whether he was experiencing a type I or type IV reaction. Therefore prick and patch testing were performed to look for evidence of immediate and delayed hypersensitivity reactions to four swimming pool-related allergens: chlorine (1% Aq), 1-bromo-3-chloro-5,5dimethylhydantoin (1% Aq), sodium metabisulfite, and ammonium persulfate. Prick test sites were read at 20 minutes with no wheal and flare reaction, indicating no evidence of immediate hypersensitivity. Patches placed on his lower back were removed at 48 hours and read at 48 and 96 hours. At 96 hours he had a 1+ to 2+ reaction to ammonium persulfate. Controls were not patch tested to control for irritancy.

The culprit pools and water park were periodically shocked with potassium peroxymonosulfate, a persulfate shown to cross-react with ammonium persulfate. This child had no known previous exposure to ammonium persulfate.

DISCUSSION

Swimming pool maintenance requires the daily addition of sanitizing chemicals such as bromine or chlorine to destroy and prevent microbial growth. The buildup of organic contaminants and chloramines and bromamines, noxious, irritating compounds resulting from the interactions of sanitizers and organic nitrogenous compounds such as sweat and urine, impedes sanitization. Amines and organic contaminants are removed using periodic “shock treatment” of pools with oxidizing agents. Pools can be shocked using superchlorination, superbromination, or “non-chlorine” shock treatments such as potassium peroxymonosulfate, which is more commonly used in brominated pools (1).

Eight cases of allergic contact dermatitis to potassium peroxymonosulfate in an aquatic setting have been reported in the literature (2–4). All cases occurred in adults and all in men. Seven of the eight developed after exposure to treated hot tubs and one after exposure to a treated swimming pool.

Ammonium persulfate has been shown to cross-react with potassium peroxymonosulfate. Seven of the eight cases reported in the literature had a positive patch test reaction to ammonium persulfate. The eighth case was patch test positive to potassium

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peroxymonosulfate, with no reaction to ammonium persulfate. One of the authors had seen six additional cases of allergic contact dermatitis to potassium peroxymonosulfate in his practice with positive patch testing to ammonium persulfate (4). The original description of contact dermatitis to potassium peroxymonosulfate occurred in a male sheep farmer exposed to treated wool (5). He had a positive patch test reaction to potassium peroxymonosulfate and ammonium persulfate.

To our knowledge, this is the first reported pediatric case of allergic contact dermatitis to potassium peroxymonosulfate. This child was counseled to avoid swimming in brominated pools and any pool shocked with potassium peroxymonosulfate.

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