

# ALLERGIC CONTACT DERMATITIS TO ALUMINUM-BASED CHAMBERS DURING ROUTINE PATCH TESTING

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## Introduction

- Aluminum is present in numerous mediums in the environment including topical medications, immunizations, antiperspirants, food and jewelry.<sup>1</sup>
- Exposure to aluminum is ubiquitous, yet allergy is rare.<sup>2</sup>
- The prevalence of aluminum allergy in the United States patch test population is difficult to estimate due to lack of data; one Swedish investigator suggests prevalence of <2%.<sup>2</sup>
- We report a pediatric case of allergy to aluminum-based patch test chambers.

## Case Presentation

An 8-year-old girl with genital dermatitis was referred for patch testing. She had previous patch testing at an outside clinic with “inconclusive” results. She was tested with the North American Contact Dermatitis Group (NACDG) panel (70 allergens) and the Duke A panel (10 allergens) in standard fashion with aluminum-based patch test chambers, with removal of patches on Day 2 and final reading on Day 4. Patch test reactions were designated as 3+ (very strong), 2+ (strong), 1+ (mild), +/- (weak/doubtful) and – (negative). The patient had mild positive (1+) reactions at every patch test chamber site, except for corticosteroids. Patch testing was repeated with plain petrolatum in an aluminum chamber, plain petrolatum in a plastic chamber, and an aluminum chamber without added allergen. Erythema which signifies a doubtful (+/-) reaction was noted for the aluminum-based chambers (with and without petrolatum), and there was no reaction for the plastic chamber. We repeated patch testing with aluminum chloride hexahydrate 2% petrolatum, aluminum 100% and aluminum hydroxide 10% petrolatum, all applied using plastic chambers. She had a mild positive (1+) reaction to aluminum chloride hexahydrate 2% and aluminum 100% and a negative reaction to aluminum hydroxide 10%. Repeat patch testing was completed with plastic wells. Results revealed weak/doubtful (+/-) reactions to Balsam of Peru, fragrance mix 1, amidoamine, sodium benzoate and nickel and mild positive (1+) reactions to hydroperoxides of linalool, hydroperoxides of limonene, and compositae. The patient was advised to avoid products containing her allergens and their cross-reactors and was returned to her pediatric dermatologist for further care.

Please see the case report summary and complete reference list here:



## Figures



**Figure 1:** Diffusely mild (1+) positive reactions to aluminum-based patch test chambers.



**Figure 2:** Erythema (seen clearer in the insets) signifying a weak/doubtful (+/-) reaction present in the aluminum-based chambers (with and without petrolatum) and no reaction for the plastic chamber.



Aluminum-based chamber without petrolatum



Plastic chamber without petrolatum



Aluminum-based chamber with petrolatum

## Discussion

- Only a few cases of pediatric contact allergy to aluminum have been reported in the setting of patch testing with aluminum-based chambers.<sup>4,5,6</sup>
- The most common routes of aluminum exposure in the pediatric population are via aluminum-containing vaccinations and hyposensitization therapy with aluminum-absorbed extracts.<sup>1</sup>
- Aluminum plays an important role as an adjuvant in vaccinations through the depot effect; it also activates the immune response to the vaccine antigen.<sup>7,8,9,10</sup>
- In the United States, there are 24 aluminum-based vaccinations offered including various formulations of DTap, Hepatitis A, Hepatitis B, Human Papillomavirus and Td/Tdap vaccines,<sup>11</sup> all associated with significant morbidity and mortality if an infection occurs due to lack of immunity. Therefore, these vaccinations should not be deferred due to aluminum allergy.<sup>12,13,14</sup>
- Although infrequent, the development of persistent, painful and pruritic nodules at the site of aluminum-containing injections is the most common manifestation of type IV hypersensitivity.<sup>3</sup>
- Some studies suggest that certain contact allergies can resolve or improve over time including pediatric aluminum allergy.<sup>1,15,16</sup>
- Others hypothesize that since the mechanism of aluminum hypersensitivity reaction is mediated through dendritic cells located in the epidermis, injecting intramuscularly can help to avoid the development of type IV allergy.<sup>17</sup>
- The optimal compound and concentration for aluminum patch testing is aluminum chloride hexahydrate 10% petrolatum,<sup>18</sup> but it is not currently commercially available for purchase.
- Of available products, the next best choice for patch testing is aluminum chloride hexahydrate 2% petrolatum.
- Although our patient had +/- reactions to the aluminum-based chambers with and without petrolatum, patch testing with an empty aluminum chamber is not reliable and should not be the sole method of determining contact allergy to aluminum.<sup>18</sup>
- In the pediatric population where the risk of aluminum hypersensitivity appears to be slightly higher due to the short time period from vaccination administration, we recommend use of plastic chambers for patch test application in order to avoid delay in diagnosis and treatment.

## Conclusions

We highlight a case of aluminum allergy incidentally identified on routine patch testing. Pediatric patients may be at higher risk for aluminum allergy due to immunization-based aluminum exposure; the use of plastic wells should be considered for patients under the age of 16. When testing for aluminum allergy, aluminum chloride hexahydrate 10% petrolatum is recommended, although this is not commercially available. The best available option is aluminum chloride hexahydrate 2% petrolatum. Interestingly, it is thought that in contrast to other type IV reactions, pediatric aluminum allergy can resolve or improve over time. Type IV aluminum allergy is not a contraindication to the use of aluminum-based immunizations, but patients with this allergy may have a slightly higher risk of resultant benign pruritic nodules.