

Hypersensitivity Reactions to Vaccine Constituents: A Case Series and Review of the Literature

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Vaccines are composed of immunogens, preservatives, adjuvants, antibiotics, and manufacturing by-products. Components of vaccines may rarely elicit adverse reactions in susceptible individuals, thus raising concerns regarding vaccine safety. In this report, we add to the medical literature 3 cases of cutaneous delayed-type hypersensitivity to the vaccine preservative aluminum. We provide a review of major constituents in vaccines that have elicited immediate-type or delayed-type hypersensitivity reactions and describe their clinical manifestations. We include a table of the Food and Drug Administration–approved vaccines, which lists the quantities of major components including ovalbumin (egg protein), gelatin, aluminum, neomycin, 2-phenoxyethanol, thimerosal, and formaldehyde. Our goals were to inform physicians on the variety of hypersensitivity reactions to common vaccines and to provide information on the choice of vaccines in patients with suspected hypersensitivity.

SINCE THE invention of vaccines more than 200 years ago, once-fatal infectious diseases have become preventable on a global level. Vaccines consist of immunogens (bacterial or viral antigens) in addition to preservatives, adjuvants, antibiotics, and by-products or residuals from the manufacturing process.¹ The additional constituents of vaccines are important in their development, immunogenicity, and safety. Rare case reports document adverse reactions to specific components of vaccines. As such, with the increasing number of available and recommended vaccines, there are concerns about the potential toxicity associated with vaccines.^{2,3}

Adverse reactions to vaccines include immediate-type (ie, immunoglobulin E mediated) and delayed-type (ie, type 4) hypersensitivity reactions. Fortunately, the rate of vaccine-induced adverse effects is low, ranging from 4.8 to 83 per 100,000 doses of the most frequently used vaccines.⁴ Furthermore, life-threatening anaphylaxis remains extremely rare, averaging 1 per 1,500,000 doses.⁴

We report 3 cases of delayed-type hypersensitivity reactions to vaccine components and review constituents that may elicit adverse reactions. Whereas adverse reactions to vaccines are not limited to hypersensitivity reactions, this review will focus on this aspect of vaccine adverse effects. We discuss some constituents

that can cause immediate-type hypersensitivity, but mainly review delayed-type hypersensitivity reactions. This is an updated report that reevaluates our previous review to: illustrate the problem through the 3 included cases; explore constituents that cause immediate-type hypersensitivity, delayed-type hypersensitivity, or both; and include a comprehensive table of the Food and Drug Administration (FDA)–approved vaccines, including the quantities of various vaccine components (ie, ovalbumin, gelatin, aluminum, neomycin, 2-phenoxyethanol [2-PE], thimerosal, and formaldehyde).²

CASE SERIES

Case 1

An 11-year-old girl presented 6 months after influenza vaccination and 14 months after a combined diphtheria, tetanus, and acellular pertussis (DTaP) vaccination for evaluation of pruritic eruptions after vaccine administration, partially relieved by oral antihistamines. See Table 1 for description of these reactions and patch test reactions. Past medical history was notable for von Willebrand disease, with no known allergy to eggs.

Case 2

A 5-year-old boy presented 2 months after DTaP vaccination for evaluation of subsequent exuberant cutaneous reaction that occurred 24 to 36 hours after immunization, relieved by oral prednisone. There was no known allergy to eggs. See Table 1 for description of these reactions and patch test reactions. Our institution's standard series of allergens for pediatric patients were not interpretable and obscured by a robust eczematous reaction.

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