

Recognition and management of anaphylaxis to vaccines

Mary S. Hayney

Anaphylaxis following immunization is very rare—about one case per 1.5 million doses of vaccine.¹ However, immunizing pharmacists must be ready to respond quickly with each immunization, because anaphylaxis can occur without warning at any time. Classic anaphylaxis is mediated by a class of antibodies called immunoglobulin E. In such cases, the individual was exposed to one or more antigens in a vaccine dose earlier in life and became sensitized. However, the allergen does not have to be in the same form at reexposure. For example, an individual who is truly allergic to eggs (a rare situation) may have had an exposure to eggs in his/her diet and then experience an anaphylactic reaction when receiving an influenza vaccine.

Screening for history of anaphylaxis

Anaphylaxis is a medical emergency. Anaphylaxis is a rapid-onset, progressive, clinical syndrome involving at least two organ systems.² The combination of cardiac, respiratory, and skin or mucosal symptoms are most specific. Cardiorespiratory symptoms are required for a diagnosis of anaphylaxis. Rhinitis, hives, or asthma symptoms alone are not sufficient for anaphylaxis diagnosis. Individuals may report an "allergy" to a vaccine or excipients that may not be a contraindication to immunization. For example, sensitivities to latex or neomycin often consist of contact dermatitis. Individuals who can eat eggs generally can receive an influenza vaccine safely.^{3,4}

Common allergens in vaccines

Vaccines are complex biological preparations. Allergies may be caused by an ingredient in the vaccine rather than the antigen itself. An allergy to a vaccine excipient should be considered in anyone who experiences an allergic re-

action following immunization. Vaccine ingredients can be found in the package insert. Appendix B (www.cdc.gov/vaccines/pubs/pinkbook/pink-appendix.htm#appb) in *Epidemiology and Prevention of Vaccine-Preventable Diseases* is another source of information.³⁻⁵

Gelatin is used as a stabilizer in many vaccines, including measles-mumps-rubella, varicella, zoster, Engerix-B (GlaxoSmithKline) hepatitis B, and Fluzone (Sanofi Pasteur) influenza vaccines. A history of intolerance to gelatin in the diet is a caution to administration of any vaccine containing gelatin.⁶

Although the incidence of latex sensitivity is growing, the risk of immunization triggering such a reaction is extremely low.⁷ Some vaccine delivery systems contain latex. If latex is present in vial stoppers or syringe plungers, it will be listed in the package insert. Individuals who have a history of anaphylactic reaction to latex should not receive vaccines that are supplied in syringes or vials containing latex unless the benefit clearly outweighs the risk.⁴

Influenza vaccine in egg-allergic individuals

Egg protein is found in influenza vaccines and yellow fever vaccine. These vaccines should not be administered to individuals with serious egg allergies that involve laryngeal swelling. Individu-

als who can eat eggs can generally receive these vaccines.⁸

All influenza vaccines licensed in the United States contain traces of egg protein. The vaccine viruses are propagated in chicken eggs. Recommendations against administering influenza vaccines to individuals with egg allergies exist. However, a number of strategies to safely administer influenza vaccines to selected sensitized populations have been developed. Importantly, administration of influenza vaccines to potentially allergic individuals should be done in a controlled setting with immediate access to emergency equipment and specialized personnel. Most community pharmacies are not appropriate sites for this approach, but pharmacists may

Table 1. Emergency supplies for vaccine reactions

Epinephrine autoinjector (two); alternatively, epinephrine ampoules (1 mg/mL) and syringes and needles
Diphenhydramine
Injectable (50 mg/mL); syringe and needle
Capsule or tablet (50 mg)
Telephone
Copy of the emergency response protocol
Resuscitation mask with one-way valve
Sphygmomanometer with cuff and stethoscope
Clock with capability to count seconds
Tourniquet
Alcohol wipes
Tongue depressors
Flashlight for throat examination

Adapted from reference 10.



Send your immunization questions to the JAPhA Contributing Editors who coordinate the **Vaccine Update** column:

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This article is supported by a Cooperative Agreement provided by the Centers for Disease Control and Prevention (CDC) entitled "Pharmacists: Connecting, Communicating and Collaborating for Improved Community Health" (1U66 IP000114). The opinions expressed in this article do not represent the viewpoints of the CDC.

offer advice and refer patients who may benefit from influenza immunization.

Immunization of potentially sensitized individuals

For other vaccines or situations, skin testing may be appropriate, in consultation with an allergist. Typically, very dilute solutions of the suspected allergen are used initially. More concentrated solutions are used in a stepwise fashion until a substantive reaction occurs or a full-strength vaccine solution is tolerated. Even with a negative skin test, a suspect vaccine should be administered only in a controlled setting by experienced clinicians. In the event that an individual has a history of anaphylaxis, alternatives to immunization should be considered.⁶ For some vaccine-preventable diseases, alternatives to immunization include chemoprophylaxis or postexposure immune globulin.

Management of anaphylaxis

Anaphylaxis typically occurs within minutes of exposure to the allergen. Signs and symptoms include flushing, facial edema, urticaria, itching, swelling of the mouth or throat, wheezing, difficulty breathing, and gastrointestinal symptoms.^{2,4} Quickly recognizing and initiating treatment can prevent emerging anaphylaxis from progressing to cardiovascular collapse.⁹ Rapid recognition of anaphylaxis is critical.¹⁰ If a patient has symptoms consistent with anaphylaxis with sudden onset and rapid progression, life-threatening compromise of breathing or circulation, and skin or mucosal changes, then anaphylaxis is very probable.¹¹ The patient should lie down immediately with legs elevated, and the emergency medical system should be activated—call 911. The pharmacist should remain with the patient continually, monitoring him/her for airway, breathing, and circulation. If a breathing patient is unconscious, the patient should be placed in the recovery position. If possible, place the patient on his/her side with the head dependent to allow drainage of any fluid and the legs bent slightly to maintain this position.¹¹ Cardiopulmonary resuscitation should be started as soon as possible, if needed. Epinephrine is the most important emergency medication. Early treatment results

in the best outcomes; therefore, epinephrine should be administered promptly. If the clinician has any doubt regarding the situation, epinephrine should be used.⁹ Epinephrine can be repeated every 10–20 minutes, with up to three doses administered as needed based on evolving symptoms or to increase blood pressure. The patient should be transported to an emergency care facility as soon as possible.

Diphenhydramine may be administered to the patient with anaphylaxis. The typical dose for an adult is 1–2 mg/kg up to 100 mg, and it may be administered orally or intramuscularly depending on the patient's situation. Oral diphenhydramine should be considered only if the individual has a slowly evolving allergic reaction, such as hives that appear more than 15 minutes after vaccine administration with no swelling of the tongue or lips or other airway involvement.

A written record of the event should be made and sent to both the patient's primary care physician and the Vaccine Adverse Event Reporting System (<http://vaers.hhs.gov/index>). The report also should be maintained in the pharmacy's immunization records.

Practical preparation can improve the safeguards provided to patients immunized in the pharmacy. Pharmacy-based immunization services should develop a protocol for anaphylaxis response. A model protocol can be found on the Immunization Action Coalition website.¹⁰ Epinephrine is a prescription drug, and its use must be specified in the immunization protocol as allowed by state law. An emergency box can be assembled using the items listed in the emergency management procedure (Table 1). A copy of the procedure also should be in the box. The box should be sealed and labeled with its contents and the expiration date of the item with the shortest date. Then, the box should be stored in the immunization area of the pharmacy. This emergency response protocol will be used very rarely, if ever, in the course of immunizing patients. Pharmacists should maintain their competency by reviewing the protocol at least annually. The review could be scheduled with recertification of basic life support skills or with blood-borne pathogens training.

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doi: 10.1331/JAPhA.2011.11510

References

- Bohike K, Davis RL, Marcy SM, et al. Risk of anaphylaxis after vaccination of children and adolescents. *Pediatrics*. 2003;112:815–20.
- Rüggeberg JU, Gold MS, Bayas J-M, et al. Anaphylaxis: case definition and guidelines for data collection, analysis, and presentation of immunization safety data. *Vaccine*. 2007;25:5675–84.
- Grabenstein JD. *ImmunoFacts: vaccines & immunologic drugs*. 36th rev. St. Louis, MO: Wolters Kluwer Health; 2011.
- National Center for Immunization and Respiratory Diseases. General recommendations on immunization: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Surveill Summ*. 2011;60:1–64.
- Appendix B: vaccines. In: Atkinson W, Wolfe CS, Hamborsky J, Eds. *Epidemiology and prevention of vaccine-preventable diseases*. 11th ed. Washington, DC: Public Health Foundation; 2009:B-1–43.
- Wood RA, Berger M, Dreskin SC, et al. An algorithm for treatment of patients with hypersensitivity reactions after vaccines. *Pediatrics*. 2008;122:e771–7.
- Russell M, Pool V, Kelso JM, Tomazic-Jezic VJ. Vaccination of persons allergic to latex: a review of safety data in the Vaccine Adverse Event Reporting System (VAERS). *Vaccine*. 2004;23:664–7.
- Fiore AE, Uyeki TM, Broder K, et al. Prevention and control of influenza with vaccines: recommendations of the Advisory Committee on Immunization Practices (ACIP), 2010. *MMWR Recomm Rep*. 2010;59(RR-8):1–62.
- Lieberman P, Kemp SF, Oppenheimer J, et al. The diagnosis and management of anaphylaxis: an updated practice parameter. *J Allergy Clin Immunol*. 2005;115(3 suppl 2):S483–523.
- Immunization Action Coalition. Medical management of vaccine reactions in adults patients. Accessed at www.immunize.org/catg.d/p3082.pdf, February 4, 2011.
- Soar J, Guideline Development Group. Emergency treatment of anaphylaxis in adults: concise guidance. *Clin Med*. 2009;9:181–5.

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