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Latex Anaphylaxis

Latex is the milky sap obtained from *Hevea brasiliensis,* a tree that grows in the Amazonian region and is used in the manufacture of natural rubber products. During the manufacturing process, various accelerators, curing agents, antioxidants, retarders, and blowing products are added. The abundant amounts of *cis*-1,4-polyisoprene that are present are cross-linked (vulcanized) with the use of heat and sulfur to make latex rubber. Natural latex products include condoms, balloons, catheters, elastic thread, rubber bands, elastic adhesives, and surgical gloves. In the latter, cornstarch powder is often added to decrease friction and increase comfort.

Although latex has been used in industry for more than a century, contact urticaria and anaphylactic reactions caused by rubber gloves have been described only recently. The first case of contact urticaria due to latex rubber was reported in 1979.[1] The first reports of intraoperative anaphylaxis associated with latex sensitivity appeared in the literature in 1989.[2–4] However, a case report in this issue of ANESTHESIOLOGY suggests occurrence of this problem at least 5 yr earlier.[5] More than 100 cases of contact urticaria and systemic reactions, including generalized urticaria, angioedema, upper and lower respiratory symptoms, and cardiovascular involvement have now been reported. At times, especially intraoperatively, these reactions have been life-threatening. Patients who have suffered severe systemic reactions often have a prior history of contact urticaria or angioedema when coming into contact with rubber products such as gloves or rubber balloons.[2,6–8]

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Populations potentially at increased risk for rubber allergy include health care workers with increased exposure to latex, usually in the form of gloves[9–11]; patients with prolonged or frequent exposure to latex products, urinary catheters in particular; and patients with congenital urologic abnormalities and myelodysplasia.[2,5,9,12–14] A study of the surgical staff at one university hospital found that 7.4% of the physicians and 5.6% of the nurses had allergic dermatitis to latex gloves,[10] and another study at a children's hospital found that 34% of children with spina bifida had antibodies in their serum specific for latex rubber proteins.[15]

Immunoglobulin E (IgE) antibodies to latex have been implicated as the cause of contact urticaria and systemic reactions. Positive *in vivo* skin tests using extracts of *Hevea brasiliensis,* natural latex, and extracts from gloves that had been soaked for 30 min in phosphate-buffered saline have been reported.[2,6,11,16] Control individuals have negative skin test responses at concentrations of extract that cause a positive wheal and flare in patients who had prior reactions to a rubber product. Incubation of extracts from latex or *Hevea brasiliensis* caused histamine release from basophils of two patients who had had previous systemic reactions attributed to rubber exposure.[2] A radioallergosorbent test (RAST) has been developed using extracts from glove washings, latex, and extract from *Hevea brasiliensis.*[2,11,16] Preliminary studies suggest that skin tests are more sensitive than RAST.[16] IgE antibodies to latex were confirmed as the cause of the reactions by passively sensitizing IgE antibodies from the reactor's serum onto normal control basophils. Incubation with latex induced histamine release from the control basophils that had been sensitized with IgE from a reactor's serum. This response could be abrogated by heat treatment of serum, which destroys IgE antibodies and by absorption of IgE using anti-IgE antibodies.[2] A provocative challenge to latex has also been described. It involves placing a latex glove on

a dampened hand for 15 min and comparing the response of the contralateral hand using a vinyl glove as a control.[11,16] Provocation tests, however, are not recommended in any individual in whom a severe, systemic reaction has previously occurred.[16]

Because of increasing numbers of reports of severe allergic reactions to latex, the United States Food and Drug Administration (FDA) has recently advised medical personnel to identify patients who may be at risk for allergic reactions to latex-containing medical devices.* The FDA suggests that questions about latex sensitivity be included in the preanesthetic evaluation, particularly in health care workers who frequently wear gloves and in children who have had multiple operations and indwelling catheters. Questions about itching, rash, or wheezing after wearing latex gloves or after inflating toy balloons may be useful. Even in the absence of a positive history to latex sensitivity, one should be prepared to treat an allergic reaction promptly and aggressively should it occur.

An important feature that appears to distinguish latex-induced anaphylactic reactions from most other anesthetic-induced anaphylactic reactions occurring intraoperatively is the delayed onset after the start of surgery. In a study of 18 cases of intraoperative anaphylaxis to latex,[13] the earliest time of onset occurred 40 min after induction of anesthesia; many reactions occurred much later. In contrast, 80% of most other anesthetic drug-induced anaphylactic reactions occurred at or shortly after induction,[17,18] within a few minutes of administration of the putative drug.

In the case of a reaction to latex, it likely requires a period of time for the responsible allergenic protein to be eluted from the rubber gloves and absorbed into the circulation in amounts sufficient to cause a systemic reaction.[19] Repeated contact of surgical gloves with mucous membranes and the loss of tissue barriers during surgery probably favors absorption of the antigen.

Patients in whom latex sensitivity is suspected should be referred to an allergist for appropriate skin testing and, if possible, RAST evaluation for definitive diagnosis. If this is not possible, the patient should be treated as if he or she were indeed sensitive to latex.

In patients known to be allergic to latex, avoidance of latex products is the only effective treatment. Although pretreatment with diphenhydramine, ephedrine, and prednisone is frequently advocated, no available evidence suggests that these measures prevent these reactions or decrease their severity. Two children in a series reported by Gold and colleagues[13] received this pretreatment regimen during subsequent surgical procedures yet still had severe adverse reactions to latex.

In latex-sensitized individuals, latex exposure can be avoided by the use of polyvinyl or neoprene surgical gloves and medical equipment made of either synthetic rubber or plastic. Gerber *et al.*[4] and, in this issue of ANESTHESIOLOGY, Sethna *et al.*[5] have shown that the use of nonlatex products for subsequent surgery successfully prevented additional adverse reactions in their patients.

Patients who have had a severe systemic reaction to latex or who are known to be sensitized to latex should be advised to purchase a Medic Alert bracelet and a supply of nonlatex rubber gloves for use in an emergency situation when nonlatex gloves may not be available.

Although latex rubber products have been used for many years, only in the last decade have cases of contact urticaria and systemic reactions to latex been described. It is possible that in the past, a connection to latex exposure and reactions was not made.[5] It is also possible that increased use of gloves by medical personnel and multiple surgical procedures in certain populations have led to increased numbers of sensitized individuals. On the other hand, the recent increased need for latex products (gloves and condoms) may have resulted in some change in the manufacturing process that has led to increased antigenicity of latex products. Resolution of these questions awaits further investigation.

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