

Latex Allergy in Children with No Known Risk Factors for Sensitization

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ABSTRACT

An increased risk of latex allergy is recognized in children with spina bifida undergoing multiple surgical procedures and in those with urogenital defects requiring frequent catheterization. In the past year, eight children (median age 2, range 1–6 years of age) with a history of latex allergy have been identified in the pediatric allergy clinic at St. Mary's Hospital. None of the children had any of the previous identified risk factors but all had a family history of atopy and a history of severe breakdown of the skin. Long-term cutaneous exposure to latex through inflamed skin preceded the development of clinical allergy in all children. We propose that children from an atopic background with eczema or other inflammatory conditions are at increased risk of latex allergy after prolonged exposure to latex. Prospective studies are needed to confirm the importance of cutaneous exposure. Recognition of cutaneous sensitization would allow intervention strategies to prevent the development of sensitization. (Pediatr Asthma Allergy Immunol 1999; 13[2]:97–101.)

INTRODUCTION

NATURAL LATEX is the product of the tropical rubber tree, *Hevea brasiliensis*, and for nearly 20 years has been known to cause allergic reactions. Reports suggest that the prevalence of latex allergy is increasing,⁽¹⁾ frequently proposing inhalation of particles as the route of sensitization.⁽²⁾ Sensitization occurs to the natural rubber protein from which several discrete antigens have been isolated.⁽³⁾ Reactions described include both type I reactions (urticaria, angioedema, bronchospasm, anaphylaxis) and delayed responses such as contact dermatitis.⁽⁴⁾

In adults, occupational exposure appears to be an important risk factor. Apart from rubber industry employees, reports of sensitization vary from 2%–10% in health care workers,^(5,6) with as many as 10% of dental students developing clinical symptoms as early as the second year of college.⁽⁷⁾ Certain high-risk groups have been recognized in the pediatric population. An increased risk of latex allergy is recognized in children with spina bifida in whom the prevalence has been reported to be as high as 37%^(8–10) and in

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TABLE 1. RESULTS OF LATEX CHALLENGE

<i>Patient</i>	<i>Sex</i>	<i>Age at presentation</i>	<i>Specific IgE (IU/mL)</i>	<i>Result</i>
1	F	5 years	>30.00	Generalized urticaria over face, neck, and arms within 5 minutes
2	M	11 months	0.00	Immediate urticaria, irritability, and vomiting
3	M	4 years	Not done	Urticaria on hand and irritability
4	M	6 years	2.24	Exacerbation of dermatitis
5	F	2 years	1.34	Exacerbation of dermatitis
6	M	14 years	0.38	Urticarial rash over hand
7	M	2 years	Not done	Urticaria and facial angioedema
8	M	2 years	1.79	Anaphylaxis during induction of anesthesia

IgE, immunoglobulin E.

children with severe urogenital defects requiring frequent catheterization.⁽¹¹⁾ However, there are also reports of children who develop latex allergy in the absence of any recognized risk factor.⁽¹²⁾

METHODS

A retrospective case-note review was undertaken of all children attending the pediatric allergy clinic at St. Mary's Hospital, London, during the 12 month period from January to December 1997. Eight allergic children with a history of latex allergy were identified. Median age at presentation was 3 years (range 11 months to 14 years). Six children were male and all were Caucasian. Five children presented with idiopathic urticaria, two with worsening dermatitis, and one with anaphylaxis occurring in the hospital during anesthetic induction for routine placement of a central venous line. Skin testing to anesthetic medications in the child was negative. In each child latex allergy was confirmed by a latex challenge. A latex cap was placed on the index finger for 20 minutes and children were observed for evidence of urticaria, angioedema and respiratory symptoms. Five children (63%) also had positive specific immunoglobulin E (IgE) testing by Immuno-CAP assay (Pharmacia, Lund, Sweden).

RESULTS

All eight children tested had positive latex challenges (see Table 1). No child was in a recognized high-risk category for the development of latex allergy although each child had a history of prolonged exposure to latex through inflamed skin as shown in Table 2 and demonstrated by the selected case histories that follow.

TABLE 2. ROUTE OF EXPOSURE TO LATEX AND PROPOSED CAUSE OF LATEX SENSITIZATION

<i>Patient</i>	<i>Proposed route of sensitization</i>
1	Eczema creams applied daily with latex finger cots over several years
2	Diaper rash: caregivers in day care centers routinely changed diapers while wearing latex gloves
3	Diaper rash: caregivers in day care centers routinely changed diapers while wearing latex gloves
4	Frequent hospitalization for infected dermatitis
5	Frequent hospitalization for infected dermatitis
6	Multiple hospital admissions for eczema in early childhood
7	Atopic dermatitis and prolonged hospital admission for endocarditis and subsequent amputation. Dressings changed and eczema creams applied by nurses wearing latex gloves.
8	Diaper rash: caregivers in nursery routinely changed diapers while wearing latex gloves

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SELECTED CASE HISTORIES

Case 1

A 5-year-old girl was referred to the allergy clinic with a 4-year history of worsening eczema and recent urticaria after wearing latex gloves. Her parents believed her to be allergic to most ointments and emollients because application of these caused worsening of her eczema. More recently the application of emollients caused immediate urticarial rashes, although administration of creams by hospital staff provoked no such reaction. On further questioning it was found that the father, a dentist, had used latex finger cots when applying creams.

Case 2

An 11-month-old boy was admitted to the hospital with breathing difficulties after eating a banana. He had a history of cows' milk and soy intolerance. Further questioning revealed that as an infant, he refused to drink from a bottle with a rubber teat but tolerated a silicone teat. After playing with balloons for a short period of time at a party, he refused further contact with them. Additionally, he had been unable to tolerate an Aerochamber™ (3M, MN, USA) rubber mask, which resulted in poorly controlled asthma. He had a history of diaper rash and had been exposed to latex daily for more than 6 months in a day care center where latex gloves were worn by the staff while changing diapers.

Case 4 and 5

A 6-year-old boy had multiple admissions to hospital since infancy for treatment of severe dermatitis and secondary cutaneous infection. The most severe areas affected were around the neck and waist. He was also noted to have worsening dermatitis after nursing care, although a large area on his chest that had been protected by a gauze dressing was clear. He had had years of exposure to latex through barrier nursing contact, central line placement for intravenous antibiotics, and other hospital procedures. He had been barrier nursed with the use of latex gloves during many of his recent hospital admissions because he was found to have methicillin-resistant *Staphylococcus aureus* (MRSA). His 2-year-old sibling, with an identical skin condition, was also demonstrated to have latex allergy. She, too, had had long-term exposure to latex during multiple hospital admissions and had had barrier nursing on these occasions.

DISCUSSION

Previous reports based on pediatric populations with latex allergy have identified children with spina bifida and those with congenital genitourinary malformations as particular high-risk groups.⁽¹³⁾ Latex sensitivity has been ascribed to children undergoing multiple surgical procedures, particularly in the first year of life. There are also studies describing latex allergy in children with no known risk factor for sensitization, although one study in particular reported that these children had severe atopic eczema.⁽¹⁴⁾ The children we describe do not conform to these high-risk categories. However, there are features common to all eight children. Each child had a family history of atopy; they all had severe inflammation and breakdown of the skin; and they all had had long-term exposure to latex prior to the first overt symptoms of latex allergy.

Recognition of the cutaneous route of sensitization has many implications. In the hospital environment, nurses use latex gloves routinely to apply creams to the skin of children with eczema or other severe skin conditions. These children may be admitted frequently due to exacerbations, placing them at increased risk of developing latex allergy. Additionally, nurses wear latex gloves for routine care procedures such as diaper changes, care of diaper rash, and the administration of intravenous medications. All these factors increase cutaneous exposure to latex. The change in practice in day care centers, where diapers are now routinely changed by caregivers wearing latex gloves, may also increase exposure outside the hospital setting.

There is evidence to suggest that abrasive cutaneous exposure through inflamed skin causes sensitization. A study into the incidence of latex allergy in health-care workers using protective gloves identified

hand eczema and atopy as being the most frequent risk factors for sensitization.⁽¹⁵⁾ There are also studies suggesting that cutaneous allergen exposure drives allergenic responses. Langerhans' cells from the skin induce differentiation of CD4⁺ T lymphocytes into Th2-like cells that drive IgE production by B cells.⁽¹⁶⁾ Clinically, there are data that suggest that sensitization to house dust mites may occur through the skin.⁽¹⁷⁾

Allergen-specific T-helper-type cells have been cultured from the skin of patients with atopic dermatitis and these have been shown to drive IgE production by B cells *in vitro*. In a murine model, allergic sensitization to ovalbumin (OVA) has been shown to occur preferentially through the skin. Sensitization in Balb/c mice to low-dose cutaneous OVA through abraded skin resulted in systemic IgE production and airway hyperresponsiveness.⁽¹⁸⁾

Our case histories highlight the fact that children with eczema or other chronic skin conditions, particularly those with an atopic background, are at an increased risk of latex allergy especially if cutaneously exposed to latex on a long-term basis. Prospective population studies are needed to identify the importance of this alternative route of exposure and to delineate the risk factors for allergic sensitization to latex. Recognition that latex allergy occurs not only in children with multiple surgical procedures is important clinically. Latex allergy must be considered in the child with chronic eczema who is cutaneously exposed to latex.

REFERENCES

1. Porri F. Prevalence of latex sensitisation in subjects attending health screening: Implications for perioperative screening. *Clin Exp Allergy* 1997; 27:413-417.
2. Baur X, Chen Z, Allmers H. Can a threshold limit for natural rubber latex airborne allergens be defined? *J Allergy Clin Immunol* 1998; 101:24-27.
3. Slater JE, Vedvick T, Arthur-Smith A, Trybul DE, Kekwick RG. Identification, cloning and sequence of a major allergen (hev b 5) from natural rubber latex (*Hevea brasiliensis*). *J Biol Chem* 1996; 41(2):304-309.
4. Sussman GL, Beezhold DH. Allergy to latex rubber. *Ann Intern Med* 1995; 122:43-46.
5. Yassin MS, Lierl MB, Fischer TJ, O'Brien K, Cross J, Steinmetz C. Latex allergy in hospital employees. *Ann Allergy* 1994; 72:245-249.
6. Grzybowski M, Ownby DR, Peyser PA, Johnson CC, Schork MA. The prevalence of anti-latex antibodies among registered nurses. *Allergy Clin Immunol* 1998; 98:535-544.
7. Katelaris CH, Widmer RP, Lazarus RM. Prevalence of latex allergy in a dental school. *Med J Aust* 1996; 164:707-708.
8. Pittman T, Kiburz J, Gabriel K, Steinhardt G, Williams D, Slater J. Latex allergy in children with spina bifida. *Pediatr Neurol* 1995; 22:96-110.
9. Slater JE, Mostello LA. Rubber-specific IgE in children with spina bifida. *J Urol* 1991; 146:578-579.
10. Porri F. Association between latex sensitisation and repeated latex exposure in children. *Anesthesiology* 1997; 86:599-602.
11. Shenot P, Rivas DA, Kalman DD, Staas WEJ, Chancello MB. Latex allergy manifested in urological surgery and care of adult spinal cord injured patients. *Arch Phys Med Rehabil* 1994; 75:1263.
12. Ylitalo L, Turjanmaa K, Palosuo T, Reunala T. Natural rubber latex allergy in children who had not undergone surgery and children who had undergone multiple operations. *J Allergy Clin Immunol* 1997; 100:606-612.
13. Kwittken PL, Sweinberg SK, Campbell DE, Pawlowski NA. Latex hypersensitivity in children: clinical presentation and detection. *Pediatrics* 1995; 95:693-699.
14. Sorva R, Makinen-Kiljunen S, Suvilehto K, Juntenen-Backman K, Haahtela T. Latex allergy in children with no known risk factor for latex sensitisation. *Pediatr Allergy Immunol* 1985; 6:36-38.
15. Charous BL, Hamilton RG, Yunginger JW. Occupational latex exposure: Characteristics of contact and systemic reactions in 47 workers. *J Allergy Clin Immunol* 1994; 94:12-18.
16. Hauser C, Snapper CM, Larsen G, Gelfand EW. T helper cells grown with hapten-modified cultured Langerhans produce interleukin-4 and stimulate IgE production by B cells. *Eur J Immunol* 1989; 2:245-251.

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17. Carswell F, Thompson S. Does natural sensitisation in eczema occur through the skin? Lancet 1986; 2:13-15.
18. Saloga J, Renz H, Larsen G, Gelfand EW. Increased airways responsiveness in mice depends on local challenge with antigen. Am J Respir Crit Care Med 1994; 149:65-70.

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