

Prevalence of IgE-mediated allergy to latex in hospital nursing staff

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Abstract

Background: IgE-mediated hypersensitivity to latex proteins has become a significant clinical problem over the last decade. Nursing and medical staff are at risk because of their occupational exposure to latex.

Aims: To determine the prevalence of type I hypersensitivity to latex allergens in the nursing staff of an Australian hospital.

Methods: A questionnaire which asked about symptoms associated with the use of latex gloves was completed by 140 nurses working in the Alfred Hospital (72 in general medical wards, 68 in intensive care units). Skin prick tests with eluates of five different types of latex glove as well as common aeroallergens (rye pollen and house dust mite) and banana extract were performed.

Results: Thirty-one nurses (22%) were skin prick test positive to at least one of the five latex glove eluates. All of these nurses were atopic, having positive skin prick tests to rye pollen or house dust mite. Symptoms of local dryness, itch and erythema associated with glove use were reported by more than half the study group, but not more frequently by those who were skin prick test positive to latex. Urticaria associated with glove use was reported more frequently by those with positive latex skin prick tests (13% *vs* 4%, $p=0.05$). Eighty-seven per cent of the nurses who were latex skin test positive were also positive to banana extract.

Conclusions: IgE-mediated hypersensitivity to latex is common in nurses working in an Australian hospital. Glove associated symptoms were frequently reported, but in most cases the symptoms were more typical of irritant or contact dermatitis rather than type I hypersensitivity reactions. However, the extent of subclinical sensitisation to latex found in this study suggests that symptomatic latex allergy is likely to emerge as an increasing problem for nursing staff in this country. (Aust NZ J Med 1997; 27: 165-169.)

Key words: IgE-mediated hypersensitivity, latex allergens, nursing staff.

INTRODUCTION

Latex gloves have been recognised as a cause of contact dermatitis for many years.¹ The inflammatory response is a consequence of cell mediated hypersensitivity to chemical accelerators used in the manufacture of latex products. However,

recognition of IgE-mediated hypersensitivity reactions to protein allergens within latex is a much more recent phenomenon. Contact urticaria while using latex gloves was first described in 1979,² and two cases of intraoperative anaphylaxis resulting from latex hypersensitivity were reported

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in 1984.³ The number of cases of latex allergy published in the literature has increased exponentially over the last decade, reflecting the greatly increased use of latex gloves by health care workers since the adoption of universal precautions.⁴ Studies performed in several different countries have found that between 5.5 and 17% of exposed health care workers have been sensitised to latex allergens.⁵⁻⁷

The manifestations of latex allergy include urticaria, rhinitis, conjunctivitis, bronchospasm and anaphylaxis.⁸ Cornstarch powder applied to gloves can adsorb latex proteins, which become airborne when the glove is used.⁹ Significant levels of latex allergens have been detected in air samples from operating theatres and hospital laboratories.¹⁰ Given these findings and the ubiquitous presence of latex products within hospitals, it is difficult for the highly sensitised hospital personnel to avoid contact with latex allergens. Accordingly, latex allergy may have profound career implications for a health care worker.

A recently published study reported a 9% prevalence of symptoms suggestive of latex hypersensitivity in dental workers at a large dental facility in western Sydney.¹¹ However, the prevalence of latex hypersensitivity among nurses working in an Australian hospital has not been reported previously. The objectives of this study were to determine the skin prick test reactivity to latex allergens in nurses and to relate these results to the symptoms which nurses attributed to glove use.

Subjects

One hundred and forty nurses employed at the Alfred Hospital (Melbourne, Victoria) were evaluated for latex allergy. Seventy-two nurses were working on general medical wards and 68 in the intensive care unit. All but four were in full time employment (working more than 30 hours a week). The protocol was reviewed and approved by the hospital's Ethics Committee and signed consent was obtained from all participants.

METHODS AND MATERIALS

The nurses were requested to complete a questionnaire which asked the average number of hours worked each week, the number of hours spent gloved each day and number of glove changes over a shift, symptoms attributed to glove use and probed a history of allergic diseases including food and drug allergies.

Skin prick tests were then performed with extracts of rye pollen, house dust mite

TABLE 1
Skin Prick Test Results

	Latex skin prick positive <i>n</i> =31		Latex skin prick negative <i>n</i> =109	
	Skin prick positive (%)	Mean wheal diameter (mm)	Skin prick positive (%)	Mean wheal diameter (mm)
Rye	84	9.3±0.6	28	7.1±0.6
House dust mite (Der p I)	97	8.9±0.6	41	5.6±0.3
Banana	87	3.9±0.2	9	3.8±0.2
Gammex	74	3.8±0.2	—	—
Conform	71	4.0±0.2	—	—
Triflex	74	4.2±0.2	—	—
Duotex	68	4.2±0.4	—	—
Profeel	48	3.9±0.2	—	—
Histamine	100	5.2±0.1	100	5.5±0.1

(*Dermatophagoides pteronyssinus*, 10,000 AU/mL), banana (1:10 wt:vol) (Hollister-Stier Laboratories), and eluates of five different brands of latex gloves. The latex glove eluates were prepared by soaking 1 g of glove cut into small pieces in a 5 mL volume of normal saline for 15 minutes and then pouring off the eluate.¹² The gloves used were Gammex and Conform (Ansell International), Triflex (Baxter Healthcare), Duotex (Smith and Nephew) and Profeel (Wembley Rubber Company). Banana extract was chosen because a cross reactivity between latex and banana (and a number of other fruits) has been reported by others.^{13,14} Normal saline was used as a negative control and histamine phosphate (10 mg/mL) as a positive control. The skin prick tests were examined after 15 minutes, and the maximum diameter of the wheals were recorded by a single observer. Wheals 3 mm larger than the negative control were considered positive.

Frequency data were compared by Chi-square analysis and non-paired *t*-tests were used to compare other values. The data are expressed as means ± standard error of the means.

RESULTS

Thirty-one (22%) of the 140 nurses tested were skin prick positive to at least one of the five latex glove eluates. There were no significant differences between the latex skin prick positive and latex skin prick negative groups in regard to age, sex distribution, years working as a nurse, hours worked each week, hours gloved each day and number of glove changes each day. A history of atopic illnesses was strongly associated with latex prick test positive results; 56% of the latex

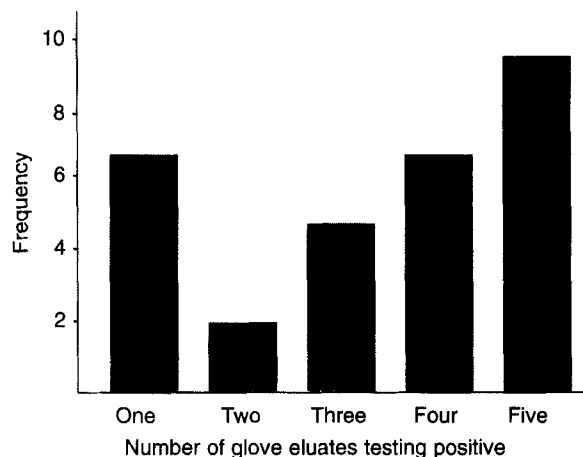


Figure 1: The number of types of glove eluates which were skin prick positive in each subject vs frequency.

positive subjects had a history of rhinitis and 28% a history of asthma, whereas none of the latex negative subjects had a history of these two conditions ($p < 0.0001$). Four of the latex positive group had a history of drug allergy and one had allergic symptoms after eating bananas.

Latex positive skin prick tests were strongly associated with atopy (which was defined for the purpose of this study as a positive skin prick test to rye pollen or Der p I) (Table 1). All of the nurses who were latex positive were atopic. Of the nurses who were latex skin prick test positive, only one third had wheals > 3 mm diameter with all five glove types tested (Figure 1). The mean wheal diameter elicited by the latex glove eluates was less than the histamine control (4.0 ± 0.1 mm vs 5.2 ± 0.1 mm, $p < 0.0001$).

A comparison of the latex exposure and latex skin prick test results is made between intensive care and medical ward nurses in Table 2.

Most of the nurses associated some symptoms with glove use (Table 3). The most commonly reported symptoms were dryness, erythema and itch affecting the skin of the hands. Except for

TABLE 2
Characteristics of Intensive Care Compared with General Medical Ward Nurses

	Intensive care <i>n</i> =68	Medical wards <i>n</i> =72	Significance
Latex skin prick positive	19 (28%)	12 (17%)	$p < 0.11$
Age (years)	30 ± 1	26 ± 1	$p < 0.0001$
Years as a nurse	10 ± 1	4 ± 1	$p < 0.0001$
Hours worked each week	38 ± 1	38 ± 1	ns
Hours gloved	3.1 ± 0.2	2.2 ± 0.1	$p < 0.0001$
Glove changes each shift	17 ± 1	9 ± 1	$p < 0.0001$

TABLE 3
Symptoms Associated with Latex Glove Usage

	Latex skin prick test positive	Latex skin prick test negative
Skin dryness	26 (84%)	80 (73%)
Itch	18 (58%)	52 (48%)
Skin erythema	17 (55%)	48 (44%)
Urticaria	4 (13%)*	4 (4%)*
Eczema	10 (32%)	29 (27%)
Eye symptoms	4 (13%)	6 (6%)
Nasal symptoms	5 (16%)	10 (9%)
Dyspnoea	1 (3%)	0 (0%)
Asthma	0 (0%)	0 (0%)
Rapid onset†	23	65
Delayed onset†	7	5

The nurses were asked to estimate the time delay between putting on gloves and onset of each symptom. If the first symptom began less than one hour after putting on the gloves, the subject has been classified as a rapid responder.

* $p < 0.05$ (comparing latex skin prick test positive and negative nurses for this symptom).

†The delay of onset of symptoms was answered by 30 of the nurses who were latex skin prick test positive and 70 nurses who were skin prick test negative.

urticaria, no symptom was reported more frequently in the latex skin prick positive group than in the skin prick negative group. In the majority of subjects, the first symptom associated with glove use occurred within an hour of putting the gloves on.

Twenty-seven of 31 latex skin prick positive subjects (87%) were skin prick positive to banana allergen. Only 10 (9%) of the latex skin prick negative group tested positive to banana extract ($p < 0.0001$).

DISCUSSION

These results show that hypersensitivity to latex allergens is common among nurses working in our institution. The proportion who were latex skin prick positive (22%) was higher than in series reported from hospitals in Europe and North America.⁵⁻⁷ Two possible explanations for the high observed prevalence are 1) the nature of the study group and 2) the method of testing for latex specific IgE. The prevalence of atopy was high in this group of Australian nurses; fifty-eight per cent of the study group were atopic and atopy has consistently been reported to be strongly associated with latex allergy.¹⁵ Skin prick testing is more sensitive than radioallergosorbent (RAST) tests,¹⁶ and eluates from several different gloves were used. As only one third of the latex positive patients developed wheals with all five gloves, testing with a smaller number of gloves eluates would have reduced the number of positive results.

The variability in skin prick test responsiveness between the different brands of gloves suggests either qualitative or quantitative differences in the allergenic proteins present in the gloves. Up to 500 fold differences in the quantity of latex allergen have been found between gloves of different manufacturers.¹⁷ In this study, there were no significant differences in the percentages of positive skin prick tests produced by eluates of the different brands. The Ansell gloves, which are regarded to be a low allergen brand, caused as many positive reactions as any of the other brands. This may be a consequence of the almost exclusive use of gloves of this brand within the hospital, resulting in the personnel being exposed to the full range of allergens contained within it.

The majority of nurses associated a number of symptoms suggestive of local irritation (dryness, erythema and itch) with glove use. With the exception of urticaria, there was no difference in the frequency of reporting of glove associated symptoms between those nurses who were latex skin prick positive and those who were not. This result suggests that in many cases latex hypersensitivity was either asymptomatic, or the symptoms caused by it were obscured by the high frequency of non-specific symptoms reported. It is likely that many of the non-specific symptoms were caused by irritant contact dermatitis resulting from regular hand washing and the skin's moist environment within a latex glove. Other cases of local irritation may represent allergic contact dermatitis. Allergic contact dermatitis has been shown to be associated with a high prevalence of immediate hypersensitivity to latex allergens.¹⁸ The dry, fissured skin of allergic contact dermatitis is likely to promote greater contact between latex protein allergens and antigen presenting cells within the dermis.

Eighty-seven per cent of nurses who were skin prick positive to latex were also positive to banana eluate, which suggests a strong biochemical cross-reactivity between these two allergens. Latex allergy has been associated with allergy to a number of fruits such as banana, avocado, chestnut, kiwifruit and others.¹⁹ Between 28 and 50% of latex allergic subjects have been reported to have banana allergy.^{13,14} A recent immunoblot inhibition study has demonstrated that more than ten allergens are involved in the cross-reactivity between latex and banana.¹⁹ In our study, only one of the 27 nurses who were skin prick positive to banana reported allergic symptoms after eating bananas. A similarly high rate of asymptomatic hypersensitivity to food extracts in latex allergic subjects has recently been reported.²⁰

The results of this study demonstrate that a large number of the nurses working in our hospital are sensitised to latex allergens. Presumably this is a result of workplace exposure, both from the wearing of latex gloves and the inhalation of latex proteins carried in cornstarch powder. The reports published to date on the prevalence of latex allergy have been confined to single time point studies and so the natural history of latex allergy remains undefined in the absence of longitudinal studies. Such studies are urgently needed so that appropriate advice can be given to nursing or other medical professionals who are found to be sensitised to latex allergens.

There are several measures which can be taken to reduce the impact which latex allergy may have on health care professionals in Australia. Greater awareness of the problem should lead to more frequent recognition of type I hypersensitivity to latex. The diagnosis of this condition has been facilitated by the recent commercial development of a standardised latex allergen. Unfortunately this allergen is not yet widely available in Australia. Once the diagnosis of latex hypersensitivity has been established, the optimal management would include the avoidance of all latex containing products. As this is virtually impossible in the hospital environment, this may require some health care workers who have had life threatening allergic reactions to seek alternative employment. In those with less severe symptoms, or who have asymptomatic hypersensitivity, reducing allergen exposure by using low allergen gloves or gloves made of latex alternatives such as neoprene and fastidious hand care to reduce irritant dermatitis, may suffice.

The high prevalence of latex hypersensitivity found in this study would suggest that latex allergy is likely to become an increasing problem for Australian health professionals. ■

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