

Minimum Prevalence of Latex Hypersensitivity in Health Care Workers

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ABSTRACT

Health care workers (HCW) have been shown to be at significant risk for developing latex allergy. Natural rubber latex hypersensitivity has been reported in 2.9 to 17% of health care workers in previously published studies. This study describes the prevalence of latex hypersensitivity in a large cohort of medical center employees. A screening questionnaire was distributed to 1967 employees in six job categories exposed to latex, and 1331 questionnaires were returned (68%) between March and November 1995. Skin and serologic testing was performed on 156 volunteers. Of the 1331 HCWs who completed the screening questionnaire, 290 (21.8%) self-reported contact dermatitis to latex, 67 (5.0%) self-reported urticaria to latex, 163 (12.2%) self-reported rhinoconjunctivitis to latex, and 17 (1.3%) self-reported asthmatic symptoms to latex. Of the total population of 1967 employees, 38 (1.9%) were either skin test or blood test positive and 30 (1.5%) of these 38 were symptomatic around latex. This study suggests a minimum prevalence of IgE-mediated hypersensitivity to latex of 1.5% among medical center employees. Our reported prevalence figures are lower than previously reported, reflecting, in part, reporting methods using a denominator more consistent with the total population at risk. Our study also illustrates the pitfall of relying on self-reporting in making the diagnosis of latex allergy. (Allergy and Asthma Proc 20:387-391, 1999)

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The first reported adverse reaction to latex was reported by Stern in 1927.¹ More recently, IgE contact urticaria reactions to latex were recognized in Europe in 1979.² Adverse reactions to latex have commonly been thought to cause contact dermatitis. In the early 1980s systemic reactions to latex tipped barium enema catheters focused attention on the potential serious nature of this sensitivity.³ The first cases of latex allergy in North America were published in 1989.^{4,5}

Over the past several years, there has been an increasing recognition and reporting of Type I latex hypersensitivity in HCWs, emergency paramedics, rubber industry workers, spina bifida patients, dental workers, and hairdressers.⁶⁻¹¹ This increase has been part of the increased recognition that Type I latex reactions may be a result of increased latex glove usage, since the onset of Universal Precautions. Increased reactions also parallel the increased awareness of latex allergy among health professionals as a result of efforts by professional organizations and new web sites devoted to latex allergy.¹²⁻¹⁶ At the Federal Drug Administration International Latex Conference in 1992, there were over 1100 voluntary reports of systemic events due to latex, including 16 deaths, and it was estimated that these reports represented less than 1% of all reactions.¹⁷

HCW are considered a risk group for latex allergy, with prevalence ranges from 2.9 to 17% being reported. The difficulty of interpreting these epidemiological reports, as most reported prevalence rates, are reporting percentages based on those who volunteered for testing rather than on the overall population. There is also a choice of diagnostic tests used to make the diagnosis of a Type I latex allergy. A recent study, such as this report, has reported both skin testing and Alastat results concomitantly.⁶ Our study is unique in that it is one of the first studies to attempt to establish minimum prevalence rates for a population at risk.

In this study, we surveyed HCW in a 715-bed tertiary care referral center. Of the total of 3700 employees, the Director of Safety and Director of Human Resources identified 1967 employees in six job categories who were regularly exposed to latex, which included food service workers, housekeepers, nursing personnel, pharmacists, respiratory therapists, and technicians. Of the 1967 questionnaires distributed through mailings or at the safety fair to latex exposed employees, 1331 (68%) were completed and returned. Of those, 156 employees volunteered for skin and serologic testing.

This study was approved by the Institutional Review of Long Beach Memorial Medical Center and done in close cooperation with the Director of Safety, the Risk Manager, and the Director of Human Resources. A screening questionnaire was prepared and distributed in two mailings to 1967 medical center employees whose job categories involved exposure to latex. Questionnaires were also distributed at the medical center's annual safety fair. Assistance in answering the questions was not provided. Data were collected between March 1995 and November 1995.

Study Questionnaire

Each subject reported on the screening questionnaire data regarding symptoms with latex exposure and a past history of any atopic condition. Patients were asked to report if they had any of the following symptoms with latex exposure: rhinoconjunctivitis, asthma, nasal symptoms, hives, anaphylaxis, and contact dermatitis. In addition, patients self-reported if they had a past medical history of allergic rhinitis, asthma, urticaria, food allergy, or eczema.

Study Population

The demographics of this study included 1331 subjects who completed the questionnaire in two mailings and at the medical center's annual safety fair. They were further divided among job categories as follows: 15 food service workers, 30 housekeepers, 801 nurses, 58 pharmacists or pharmacy workers, 18 respiratory therapists, and 409 technicians, including laboratory, radiology, and surgery technicians. Subjects volunteered for skin testing and serologic testing. Informed consent was obtained. Of the 1331 em-

ployees who completed the questionnaire, 156 volunteered for skin and serologic testing for latex allergy (Table I).

Skin Prick Test

Skin testing was performed on all consenting participants using ammoniated and glove extracts as previously described.¹⁸ Latex allergen content rather than protein determination was used to measure potency of the above latex skin testing materials. IBT Reference Laboratories (Lenexa, KS) measured the latex allergen content using an ELISA inhibition assay developed from pooled latex-allergic patient sera. The milligram of allergen per milliliter of the skin prick extracts were (1) ammoniated batch 1 (Johnson & Johnson) 2.61; (2) ammoniated batch 2 (Johnson & Johnson) 3.64; (3) ammoniated batch 3 (ALK Laboratories) 2.22; (4) Digitcare glove extract, 2.49; (5) Safeskin glove extract, 2.55; and (6) VHA glove extract, 2.91.

Skin testing was done by the punch technique, using the DermalPIK (Greer Laboratories, Lenoir, NC) and read 15 minutes after application.¹⁹ Histamine phosphate 1 mg/mL was used as positive control, and albumin-saline solution as negative control (Hollister-Stier, Spokane, Washington). Results were considered positive if the largest wheal diameter was 50% or greater than that of the histamine control, and at least 3 mm larger than the negative control.

A positive raw skin test was defined as a positive result to at least one of the three raw testing materials. Similarly, a positive glove skin test was defined as a positive result to at least one of the three glove prick test materials. The overall skin prick test was defined as positive if at least one of the raw or glove skin pricks was positive. All measures to treat adverse reactions were readily available.

Serologic Testing

Serologic testing was done to determine the presence of latex-specific IgE antibodies. Serum was drawn, and testing was done using the AlaSTAT Microplate assay (Diagnostic Products Corporation, Los Angeles, CA). Class I or higher was coded as a positive result.

TABLE I

Study Population Completing the Questionnaire

Job Title	Total Number of Workers	Completed Survey	Volunteered for Testing	% of Responders
Food service	43	15	1	6.7
Housekeeper	114	30	2	6.7
Nursing	1033	801	107	13.3
Pharmacy	90	58	3	5.2
Respiratory therapist	107	18	2	11.1
Technician	580	409	39	9.5
Total	1967	1331	156	11.7

RESULTS

The data gathering phase of the study resulted in the distribution of 1967 questionnaires of which 1331 (68%) were completed and returned. In the study population of 1331, 290 (21.8%) self-reported contact dermatitis to latex, 68 (5.1%) self-reported urticaria to latex, 163 (12.3%) self-reported rhinoconjunctivitis to latex, and 17 (1.3%) self-reported asthmatic symptoms to latex (Table II). Total self-reporting of experiencing symptoms to latex varied from 12–32% (Table II).

From the 1331 HCWs who completed the questionnaire, 156 (11.7%) volunteered to undergo skin and serologic testing for latex allergy. Thirty-eight of these 156 volunteers were either skin or blood test positive (Table III). Of these 38 volunteers who had a positive skin or blood test to latex, 30 experienced Type I mediated symptoms when exposed to latex.

There was a high self-reported past medical history of atopy in both the latex allergic negative group (77.3% (99/128)) and the latex allergy positive group (82% (23/28)). Table III also illustrates the poor sensitivity of the AlaSTAT in vitro assay. We had reported elsewhere the poor sensitivity of in vitro testing compared to skin testing, and similar findings have been reported in the multi-center study, where a nonammoniated latex reagent was compared to three FDA approved in vitro assays.^{18,20}

The 30 volunteers who tested either skin or blood test positive to latex and were symptomatic with exposure represented the minimum number of latex allergic volunteers in the study population. The total population of 1967 employees who were exposed to latex was used as the population denominator used to calculate a minimum prevalence rate. The resulting calculation showed that the minimum prevalence of latex allergy among HCW was 30/1967 (1.5%).

DISCUSSION

This study found a minimum prevalence of latex hypersensitivity of 1.5% among 1967 HCWs regularly exposed to latex gloves in the workplace. This result is much

lower than previous reports that describe the prevalence of latex hypersensitivity as 2.9 to 17%. The lower prevalence in this study is due to the fact that the study population was calculated using a denominator reflecting the total population exposed to latex gloves as opposed to using the population who volunteered for testing. The lowest previous reported prevalence among HCWs was 2.9% of 512 hospital employees who volunteered for skin testing in Finland.²¹

In the study questionnaire distributed to HCW exposed to latex, 27% of respondents self-reported being symptomatic to latex. This high self-reporting rate has been noted in many studies using a questionnaire as an investigative tool.^{22,23} History alone clearly overestimates the actual prevalence of latex allergy when skin or blood tested. This demonstrates that one cannot rely on the history alone to make the diagnosis of latex allergy. Although this study also relies on self-reporting or volunteering for testing like other studies, the major difference with this study is that it reports the total population at risk, as opposed to the number of people who volunteered for testing.

Previous studies both in HCWs and in the general population have revealed a trend toward a lower prevalence of latex hypersensitivity in European studies and a higher prevalence in studies conducted in North America. In the United States, Yassin found a prevalence of 17% and Arrellano reported a prevalence of 9.9%. Kaczmarek reported 5.5% in a cross-sectional study done in nine hospitals across the country.^{24–26} All three studies reported the tested population rather than the entire incumbent population at risk. Safadi found prevalence of 10% in emergency medical providers and 12% in dental professionals in two studies done in the United States.^{11,27} In Canadian operating room nurses, Mace found a prevalence of 6.9%.²⁸ In European HCWs, Vandenplas reported a prevalence of 4.7% in Belgium, and Turjanmaa reported a 2.9% prevalence in Finland.^{21,29} It is not clear, when these studies are reporting prevalence percentages of the tested population, whether they reflect the entire population at risk.

In the general population, Turjanmaa found a 0.12% prevalence in unselected surgical patients in Finland.

TABLE II

Self-Reported Symptoms to Latex of 1331 Questionnaire Respondents

Job Title	Total Self-Reporting Symptoms to Latex#	Contact Dermatitis*	Urticaria#	Rhinoconjunctivitis#	Asthma Symptoms#
Food service	4 (27%)	3	0	2	0
Housekeeper	8 (27%)	3	3	4	2
Nursing	259 (32%)	216	43	112	12
Pharmacy	7 (12%)	5	3	1	0
Respiratory therapist	7 (39%)	7	2	5	0
Technician	76 (19%)	56	16	39	3
Total	361 (27%)	290 (21.8%)	67 (5.0%)	163 (12.2%)	17 (1.3%)

*Type IV mediated symptom. #Type I (IgE-mediated) symptom.

TABLE III

Skin and Blood Test Results for 156 Volunteers from the 1331 Who Completed the Questionnaire

Job Title	Number of Volunteers	Skin Test Positive	Blood Test Positive	Total Skin or Blood Test Positive	Symptomatic* Around Latex and Positive Skin or Blood Test
Food service	1	0	0	0	0
Housekeeper	2	1	1	1	1
Nursing	107	25	15	27	20
Pharmacy	3	0	0	0	0
Respiratory therapist	4	1	0	1	1
Technician	39	10	3	9	8
Total	156	37	19	38	30

*Type I (IgE-mediated) symptoms.

Higher numbers were reported by Ownby and Merritt in separate papers; Ownby in Detroit reported a prevalence of 6.4% among volunteer, nonhealthcare blood donors, and Merrett in the United Kingdom found a prevalence of 7.7% for latex-specific IgE antibodies in blood donors.^{30,31} Similarly, in a study of 99 HCWs with no risk factors for latex allergy, 11% had a positive CAP or AlaSTAT blood test for latex allergy.¹⁸ In an unpublished series done by the National Health Assessment Nutritional Evaluation Survey, 19% of 4228 people in the general population had a Class I AlaSTAT or higher (personal communication). Such high prevalence numbers for a positive AlaSTAT may reflect cross reactivity allergy to foods or problems with the assay rather than a true sensitization to latex.

Exposure to latex and patterns of usage may be different, not only among different countries, but from hospital to hospital. Even different individuals in the same job at the same hospital may have involved exposures that vary as much as 100-fold as measured by individual personnel depending on the specific tests being performed.³² Recently, Sussman found the incidence of latex sensitization among latex glove users in HCWs in Canada to be about 1% in a study of 947 hospital employees, 435 of whom were followed for 1 year.³³ A recent study identified latex aeroallergen level of 0.6 ng/m³ as a critical threshold, above which workers can develop Type I latex allergy symptoms.³⁴ Because latex allergen has been found in respirable particulate or air sampling of urban air, it could conceivably lead to the sensitization in the general population.³⁵

Epidemiological studies to date, including this one, have been examinations of a population at a single point in time with exception of Sussman's study, which showed a 1% incidence of latex sensitization in HCWs.³³ Longitudinal studies are needed to better define risk factors, the progression and/or regression of symptoms with various levels of exposure, and the true prevalence of latex hypersensitivity in the population.

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