Natural Rubber Latex Allergy, An Epidemic in the Health Field

Carl W. Lehman MD

Abstract:
The objective of this paper is to educate health care providers of the markedly increased incidence of natural rubber latex (NRL) allergy to epidemic proportions during the past 10 to 12 years. A review of latex allergy problems in health care providers as well as patients is presented. Also reported is a questionnaire survey of institutions listed with the Health Care Association of Hawaii.

Introduction:
Natural rubber latex proteins are products derived from the milky fluid (latex) commercially produced from the rubber tree, Hevea brasiliensis. Synthetic latex, as used in latex paints, does not cause allergic reactions in patients with natural rubber latex allergy. For easier reading, “latex,” unless otherwise indicated, will refer only to natural rubber latex in this article.

The incidence of latex allergy has markedly and progressively increased by an estimated 64 fold during the past 10 years. The seriousness of an anaphylactic reaction to latex is compounded by the fact that many items commonly used to treat anaphylaxis may contain latex which if used, violates the primary principal of avoiding further exposure to the allergen inducing the reaction.

This article addresses significant latex allergy problems that affect both patients and health care providers who are affected with latex allergy when they, themselves, need health care. Also reported is a survey of a study of 18 Hawaii hospitals and 4 nursing homes.

Methods:
A cursory review of the literature concentrating on review articles, was done to provide basic information about latex allergy in this article. Questionnaires with a letter of explanation were sent to the Chief Executive Officer or comparable person of 41 member institutions of the Health Care Association of Hawaii. The recipient was asked to answer question #1 and refer the other questions to the most appropriate individual in that institution for a response. Twenty-two completed questionnaires were returned. The questions were condensed to the subject addressed in each question and the results are tabulated in table 1.

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<td>3. Has operating room(s) entirely latex free</td>
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<td>4. Latex-free patient rooms</td>
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<td>5. Number of employees at risk of latex allergies 8,301</td>
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<td>6. Known employees with latex allergies</td>
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<td>d. list other factors</td>
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<td>10. Understanding of hypoallergenic gloves</td>
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Results:
The yes/no answers are self explanatory with a few exceptions as noted under other “see text”.

The one “no” answer on question #1 was from a hospital that is properly addressing latex allergy problems. The “no” response was due to being unaware of the “epidemic” aspect.

Questions #5 & #6: The total number of employees listed by the various hospitals and other facilities responding was 14,238. The number of supportive workers that have direct contact with patients is listed in table 1: Sixty-seven known latex sensitive employees reported in the study is 0.52% of the total number of workers employed. Of this number, 9 were contact allergic dermatitis only.

Question #7: One hospital that is latex-free had no cases. No one was terminated from employment due to latex allergy. One was assigned to another job. Thirteen changed to wearing non-latex

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Questions 5 & 6: The total number of employees listed by the various hospitals and other facilities responding was 14,238. The number of supportive workers that have direct contact with patients is listed in table 1: Sixty-seven known latex sensitive employees reported in the study is 0.52% of the total number of workers employed. Of this number, 9 were contract allergic dermatitis only.

Question 7: One hospital that is latex-free had no cases. No one was terminated from employment due to latex allergy. One was assigned to another job. Thirteen changed to wearing non-latex gloves. Two of these were also assigned to another job.

Question 9 & 10: Other factors listed as significant in determining purchase of latex gloves were availability, various details of contracts, user need, elongation properties, specific objective RAST and LEAP data, powder-free, and characteristics that provide protection required for infection control.

Questions 11 & 12: The author participated in providing a 1 hour education session, using a video tape and slides to discuss latex allergy problems at each of 3 hospitals. Information was sent to all of those requesting additional information in question #12.

Summary: This study reveals that key personnel from each organization are well aware of the problem of latex allergy being on the increase. While 2/3 of the institutions in this study are appropriately addressing problems with latex allergy, 1/3 need to take significant action. Most of these requested assistance to address their problems. In this survey, the incidence of known latex allergic individuals reported is below that expected for the general population and about 20 times less than expected in health care workers. If cases of latex sensitive workers are missed or not addressed, those sensitized health care workers with continued exposure to latex are likely to become progressively more sensitive and develop a more severe illness. Severe allergic reactions may cause devastating health problems for the sensitized employee including rare case of inability to perform duties, sometimes in highly specialized jobs, and lead to very costly workers’ compensation payments.

Discussion: Type I, IgE mediated latex allergic reactions may be severe, causing death or even death. Sensitization results from exposure of susceptible individuals to latex rubber proteins possibly enhanced by presence of endotoxin which may act as an immunologic adjuvant. Presence of these potential allergens varies tremendously among manufacturers and even from batch to batch. Allergic reactions to a wide range of medical products that contain latex have been reported including latex surgical gloves, adhesive bandages, intravenous infusion sets, and anesthesia equipment. Latex gloves are the largest single source of exposure to these potent allergens. Exposure to a latex allergen may be direct contact with an offending device or by inhalation of allergens carried by the contaminated powdered rubber gloves.

The clinical manifestations of latex allergy range from classic contact urticaria (Type I IV reactions) to contact urticarial syndrome and systemic allergic reactions culminating in anaphylaxis (Type I reactions). Continued exposure to latex in sensitized persons may progress to generalized IgE-dependent allergic responses including generalized urticaria or pruritis, rhinoconjunctivitis, asthma, or anaphylaxis which may present as hypotension, shock, respiratory failure, and may be fatal. Treatment of an anaphylactic reaction may be items that contain latex materials and further worsen the anaphylactic reaction (see table 2).

Latex occupational exposure from powdered gloves, especially in anesthetics, may lead to persistent impairment and, although rarely, may prevent a worker from remaining in that environment. The American Academy of Asthma, Allergy and Immunology and the American College of Asthma, Allergy and Immunology boards of directors issued a position statement concerning exposure to powdered and non-powdered natural rubber latex gloves. The following steps should be taken to lessen risk of exposure to latex protein: Latex gloves should be used only as mandated by accepted Universal Precaution Standards. The routine use of latex gloves by food handlers, housekeeping, and medical personnel in low risk situations (e.g., food handling, bed transport, routine physical examination) should be discouraged. Only low latex gloves should be purchased and used. This may reduce the occurrence of reactions among sensitized personnel and should reduce the rate of sensitization. Only powder free latex gloves should be purchased and used. This will nearly eliminate latex aerosol levels and exposure.

As of September 30, 1995, the Food and Drug Administration (FDA) issued a final rule requiring that all products containing natural rubber latex that contacts humans, state: "Caution, This..."
The next published case appeared 52 years later. The earliest North American reports were published simultaneously in 1989. Over the next 4 years, the US FDA received over 1,100 reports of injury or death associated with latex exposure, with some cases leading to the earliest reports of latex allergy and anaphylaxis. These cases were due to latex gloves used in hospitals and clinics.

According to Sullivan, recent estimates place the prevalence of clinically important IgE sensitivity to latex at nearly 1% of the total US population. This is highest in individuals with a history of allergies to latex.

The clinical history in patients with type I IgE-mediated latex reactions is often coinciding and compelling. However, it alone is not sufficient to definitively establish a diagnosis of latex allergy.

The prevalence of IgE to natural rubber latex antigens in various US populations:

- <1% of the general population.
- 1%-6% of allergic individuals.
- 1%-2% of atopic individuals.
- 6%-10% of hospital staff.
- 5%-7% of RNs with frequent glove use.
- 20%-30% of atopic exposed RN/MO.
- 50% of skin biopsy patients.
- 8%-12% of dentists and dental assistants report latex allergy on questionnaire.

In a volunteer study group of 247 nurses who were recruited from the Operating Room Nurses Association of Canada Annual Meeting, all underwent skin prick testing with 17% of the group tested positive to latex. One hour later, thirty-five (54.7%) described allergic symptoms attributed to latex exposure. Of these only 12 (4.9%) tested positive to latex extracts alone, 12 (4.9%) positive to food extracts alone, and 5 (2.0%) positive to both latex and a reactive food to cooked eggs (kiiwi, banana, avocado, and potato). Three of the 17 (16.7%) nurses who tested positive to latex had no history of reacting to latex.

Indirect latex was done on the serum of the skin test positive patients with a 70.6% sensitivity.

Fifty-four percent of the participants attributed symptoms to latex exposure. The most common symptom was a rash on the hands, including urticaria and pruritus. Eleven of 17 (64.7%) of the symptoms tested positive to latex had two or more symptoms referable to either skin rash or blistering, eyes with ocular swelling, burning or itching, or respiratory symptoms. Thirty-nine of the 158 (28.8%) reported reactions to latex products other than gloves. A history of atopy was strongly associated with the latex skin prick test positivity. Thirty-five of 230 (15.2%) non-atopic individuals compared with 9 out of 17 or 52.9% reactors with a history of atopy. A large number of nurses wearing latex gloves noted irritation of their skin. It should be noted that both delayed hypersensitivity to latex and irritant dermatitis would contribute many of these individuals.

To date there is no standardized latex solution available for assessing these patients. Testing done in Canada with natural rubber latex allergens provided a positive response in 94% of subjects who also reacted to 1 or more of the glove extracts.

This suggests that skin prick testing with a battery of glove extracts of known protein content may be used for accurate evaluation of natural rubber latex allergy.

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This suggested that prick skin testing with a battery of glove extracts of known protein content may be used for accurate evaluation of natural rubber latex allergies.

The clinical history in patients with type 1 IgE mediated latex reactions is often both convincing and compelling. However, it alone is not sufficient to definitively establish a diagnosis of latex allergy.

Hamilton, et al, reports a multicenter latex testing efficacy study using non-aminomitted latex. The extract, processed by Greer Laboratories which was prepared from sap taken directly from the Hevea brasiliensis tree and serially tested at doses of 1,100, and 1,000 mcg/ml per ml using a prick puncture technique with bifurcated needles.

The clinical history combined with 1 or 2 stage latex rubber glove provocation assay was used to determine the definitive allergic latex status of 324 subjects enrolled in the study. The diagnostic specificity of the agent was demonstrated to be 100% and the sensitivity was 95% at the 100 mcg/ml per ml concentration with none of the patients in the non-latex allergic group developing a positive skin test response. At the 1,000 mcg/ml per ml concentration, the diagnostic sensitivity and specificity were 99% and 96% respectively.

The report of this study is promising and hopefully latex skin testing material will soon become available to assist in a definitive diagnosis. A definitive diagnosis is particularly important as it relates to social, occupational, and other legal ramifications of the condition.

**Conclusion:**

In conclusion, natural rubber latex allergy has increased tremendously during the last 10 to 12 years. The most common exposure in health care workers is to latex gloves. Powdered latex gloves creates a significant environmental problem in acting as a vehicle to allow the latex proteins to be airborne. The use of powdered latex gloves should be discontinued in all health care facilities including physicians, offices, hospitals, and other health care facilities. Anaphylactic reactions to latex proteins are especially serious and compounded if an anaphylactic reaction is inadvertently treated with devices containing latex. Latex contact to mucosal or serosal surfaces may produce anaphylaxis in sensitive persons who only develop dermatitis with skin contact.

Latex allergy diagnosis is made by taking an appropriate history to establish atopy in the patient and/or allergic type reactions when the person is exposed to latex products. RAST or similar tests may be of value, but are not definitive to establish the diagnosis. Hopefully, standardized skin test materials will be available soon. Prevention is to minimize exposure and to decrease the risk of sensitization by purchasing non-latex products or latex products with a low content of latex and minimal endotoxin contaminant. Treatment of the sensitized patient is by avoidance of exposure and symptomatically if exposed. Labeling latex products and appropriately excluding the misleading term "hypoallergenic" from labels on latex products dispensed after September 30, 1998 will assist in more appropriate purchase of products and implement improvement of manufacturers standards. The study reported in this article indicates that continued education of health care workers in Hawaii regarding the subject of latex allergy must be pursued.

**References:**

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