

Management of natural rubber latex allergy

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Issues of impairment, compensation, and disability are appropriately directed at health care workers with latex allergy and occupational asthma or anaphylaxis who may not be able to re-enter a work environment with ambient exposure to latex proteins. The following stepwise approach for managing a high-risk health care worker with natural rubber latex (NRL) allergy is recommended: (1) confirm the diagnosis of NRL allergy by using rational, validated methods; (2) justify cessation of further NRL exposure in the workplace; (3) determine whether there is impairment and disability resulting from NRL allergy; (4) advise employer and risk managers regarding the diagnosis and their responsibility to institute effective environmental interventions; (5) if accommodation efforts are unsuccessful, advise the worker to seek workers' compensation benefits and rehabilitation. Objective evidence of residual impairment caused by NRL-induced anaphylaxis or occupational asthma is often absent. Therefore, the physician must determine disability based on how work restrictions resulting from NRL allergy affect the worker's ability to perform current required tasks and duties. According to the Americans with Disabilities Act, the employer must make reasonable accommodations for an impaired employee. Therefore, an employee with NRL allergy and no objective evidence of impairment would not be considered to be disabled after successful interventions, which totally eliminate continued NRL protein exposure and the risks of work-related asthma and anaphylaxis. (*J Allergy Clin Immunol* 2002;110:S111-6.)

Key words: *Latex, allergy, management*

The physician subspecialist who is qualified to evaluate health care workers (HCWs) for natural rubber latex (NRL) allergy is expected to play a central role in all phases of case management. A physician, who is first and foremost the patient's advocate, must recommend those actions that ensure the long-term health and well-being of the patient. At the same time, a consultant must be sensitive to the impact that any medical decision might bring to bear on the patient's career and livelihood. Because of concerns about future employability, some HCWs with severe NRL allergy may be reluctant to seek evaluation, fearing that recommended interventions or treatments

Abbreviations used

HCWs: Health care workers

NRL: Natural rubber latex

OA: Occupational asthma

could have adverse consequences on their jobs. HCWs are highly motivated, altruistic, and dedicated employees who may be in states of denial about occupational illnesses. Ideally, a physician must be prepared to not only perform a comprehensive medical and immunologic evaluation for latex allergy but must deal with other issues including workers' compensation, evaluation of impairment, and disability.

The consultant should be prepared to play a pivotal role as an intermediary between the worker and the employer or the employer's representative (eg, risk manager). This role should be constructive and aimed at planning effective interventions, on behalf of a temporarily disabled worker, that are likely to abolish work-related symptoms and work-related disability. It is incumbent on the physician to influence the employer to institute measures that will eliminate ambient and/or direct cutaneous latex allergen exposure and associated allergic cutaneous or respiratory symptoms. Every attempt should be made to accommodate a worker and preserve the current occupation. This goal is achievable in most but not all instances of work-related latex allergy.

ILLUSTRATIVE CASE STUDY

The case presented here illustrates the important roles played by the physician consultant in the diagnosis and administrative management of NRL allergy.

A 48-year-old nurse who has worked in the surgical intensive care unit for 12 years presents with the chief complaint of wheezing and dyspnea at work. For approximately 8 years, she had experienced erythema and pruritus of the dorsal aspects of the hands and wrists that begin 15 minutes after donning powdered latex gloves. Approximately 3 years ago, she noticed daily wheezing, shortness of breath, and chest tightness that began after 30 minutes at work and resolved after going home and on the weekends. In the past 6 months, she noted that wheezing and dyspnea had increased and continued when she was away from work. She awakened 1 to 2 times during the week with symptoms of asthma. For the past 7 years, she had been using nonlatex nitrile gloves. However, she worked alongside 7 coworkers in the unit who each used 30 pairs of powdered latex gloves per shift.

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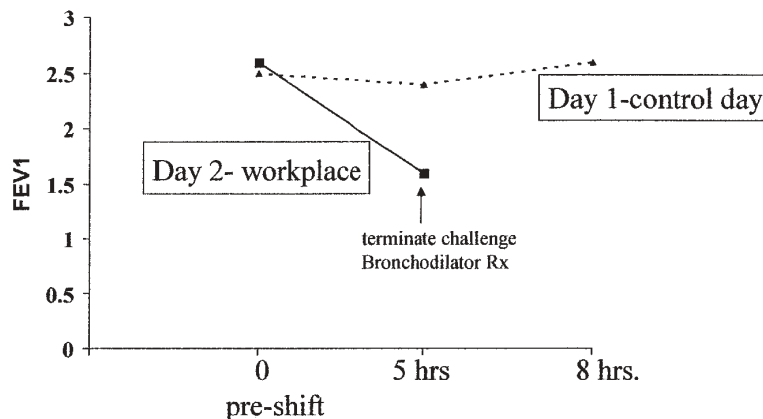


FIG 1. A workplace challenge performed in a nurse given a diagnosis of NRL-induced OA. Results of changes in FEV₁ are shown during work in an NRL-free hospital area (day 1) and during work in the intensive care unit when coworkers were using NRL powdered gloves (day 2).

An allergist was consulted. The result of a skin prick test with a 1:100 dilution of an NRL extract was positive. FEV₁ was 72% of predicted value and increased by 23% after bronchodilator administration. At this stage, the patient related a medical history that was quite consistent with contact urticaria and occupational asthma (OA) associated with exposure to NRL gloves. According to the National Heart, Lung, and Blood Institute guidelines for classification of asthma, the patient fit the category of moderate persistent asthma. Despite confirmation of asthma by demonstration of reversibility in FEV₁ and of NRL sensitization by skin testing, work-related asthma has yet to be confirmed. Because the results and recommendations of this evaluation are important to both the employee and employer, unequivocal diagnostic confirmation is required. Therefore, a workplace challenge was conducted (Fig 1). The worker was monitored during a control day in an NRL-free hospital area and, subsequently on the next day, when she reentered the intensive care unit where coworkers were dispersing NRL glove proteins into the ambient environment during their normal daily activities.

Once the diagnosis of OA had been established, this worker was placed on temporary total disability and restricted from performing any job that entailed direct cutaneous or inhalational exposure to NRL allergens.¹ At that time, it was appropriate to apply for workers' compensation to recover lost income and/or medical expenses. The physician informed the employer, as well as the affected worker, about the intervention options that could prevent allergic symptoms associated with NRL exposure. These options included moving to an NRL safe work area in the same health care facility or conversion of the employee's current work area to an NRL safe area. If the employer is unable to accommodate the worker, the patient must leave the health care facility and apply for workers' compensation and rehabilitation.

The HCW presented in this case was transferred to an NRL powder-free outpatient unit. Administration of an inhaled corticosteroid combined with a long-acting bronchodilator, salmeterol, was initiated. At a follow-up visit

2 months later, FEV₁ had increased to 82% of predicted value, the patient no longer reported nocturnal symptoms, and daytime symptoms occurred only during exercise.

An institutional committee was formed afterward to implement a primary prevention program to prevent new cases of NRL allergy. The committee considered the relative costs of low-protein NRL gloves and non-NRL substitute glove products versus current NRL products. The potential costs of disability, workers' compensation, and loss in productivity were considered in the decision process. Subsequently, it was decided to purchase non-NRL substitutes. Since glove changes were instituted in 1997, no new cases of NRL allergy have been reported at the institution.

MEDICAL AND OCCUPATIONAL EXAMINATION

A complete medical and occupational history is necessary. An itemized questionnaire (or highly structured interview), specifically designed for NRL allergy, is administered to capture work-related symptoms, medical and nonmedical exposure to NRL products, food allergies, and treatments or interventions. A list of the key elements of a structured medical occupational interview is shown in Table I. If the history is consistent with NRL-triggered asthma, occupational rhinitis, or contact urticaria, it is incumbent upon the physician to confirm or rule out sensitization to NRL allergens.

The clinical diagnosis of latex-induced contact urticaria is based on a compatible history and evidence of sensitization to NRL allergens. Sensitization is confirmed by a Food and Drug Administration–approved *in vitro* assay for serum-specific IgE (eg, CAP [Pharmacia-Upjohn, Uppsala, Sweden] or AlaSTAT [Diagnostic Products Corp, Los Angeles, Ca]) or a positive skin prick test response to a suitable NRL antigen.^{2,3} Contact urticaria, an IgE-mediated condition, is recognized in HCWs with pruritus, erythema, and/or hives beginning 20 to 30 minutes after donning NRL gloves. Similarly,

TABLE I. Key elements of the occupational history in the evaluation of latex allergy

I. Demographic information
II. Employment history
A. Current department and job description including dates begun, interrupted, and ended.
B. List all processes and substances used in the employee's work environment. A schematic diagram of the workplace is helpful to track other direct or indirect exposure emanating from various work stations.
C. List prior jobs at current workplace with description of job, duration, and identification of material used.
D. Work history describing employment preceding current workplace. Job descriptions and exposure history must be included.
III. Symptoms
A. Categories
1. Erythema, itching, hives after donning gloves
2. Chest tightness, wheezing, cough, shortness of breath
3. Nasal rhinorrhea, sneezing, lacrimation, ocular itching
4. Systemic anaphylaxis
B. Duration of symptoms
C. Duration of employment at current job before onset of symptoms
D. Identification of temporal pattern of symptoms in relationship to work
1. Immediate onset beginning at work with resolution soon after coming home
2. Delayed onset beginning 4 to 12 hours after starting work or after coming home
3. Immediate onset followed by recovery with symptoms recurring 4 to 12 hours after initial work exposure
E. Improvement away from work
IV. Identify potential risk factors
A. Current smoking status and candidate number of pack-years
B. Asthmatic symptoms preceding current work exposure
C. Allergic history
1. History and date of onset of seasonal nasal or ocular symptoms
2. Immediate family history of atopic disease
3. Previous skin testing with latex or common aeroallergens
4. Immediate onset reactions after ingestion of foods (eg, banana, kiwi, avocado, papaya, chestnuts, potato)
D. Prior or concurrent exposure and/or reactions to latex-containing products in nonoccupational settings (eg, rubber bands, balloons)

Adapted from Ref. (4), p. 146, by courtesy of Marcel Dekker, Inc.

NRL-triggered occupational rhinitis is diagnosed by immediate-onset work-associated nasal and ocular symptoms triggered by exposure to powdered NRL gloves. Anaphylaxis, triggered by ambient or systemic NRL allergen exposure via powdered NRL gloves, is established by review of relevant medical records from emergency treatment facilities and demonstration of NRL allergen-specific IgE.

The diagnosis of OA is less reliant on subjective data obtained from the medical history. Objective criteria should be used to unequivocally establish a diagnosis of OA caused by NRL protein allergens. Published guidelines have established minimal criteria for diagnosis of OA and OA caused by a natural protein allergen.^{4,5} These include:

1. A history compatible with OA or asthma symptoms that are increased at work and improve at home or on vacation.
2. Demonstration of reversible ($\geq 12\%$) airflow obstruction or increased nonspecific bronchial hyperresponsiveness.
3. Presence of specific IgE for the causative allergen.
4. Demonstration of decreased lung function (FEV_1) associated with exposure to the causative agent.

The fourth criterion is essential. Although the medical history and immunologic tests are sensitive enough to be used in screening workers, they lack the specificity required to confirm OA.^{6,7} The gold standard for diagno-

sis of OA is either a "workplace challenge" in which airflow obstruction is demonstrated at work with exposure to latex gloves or by a controlled inhalation challenge to the workplace agent in a specialized challenge laboratory. The former approach (ie, workplace challenge), if possible, is preferred in that it may be impossible to reproduce all conditions of exposure that are encountered in the workplace in a challenge laboratory.

Administrative management

Once the diagnosis is established, the consultant must determine the degree of impairment caused by the NRL-induced allergic condition. Second, the physician must inform and educate the worker regarding available intervention and treatment options. If the condition can result in total disability from performing the required task of the job (eg, OA or anaphylaxis), the worker should be advised to avoid that work exposure until an accommodation is instituted at work. The worker should also be informed about applying for workers' compensation benefits to cover medical expenses and lost wages. A worker with OA or NRL-induced anaphylaxis is considered to be 100% impaired from performing his or her specific job if it entails exposure to the causative agent.⁸ Once the diagnosis has been confirmed and an effective intervention(s) identified, the physician must inform (with the patient's consent) the employer and risk managers regarding the diagnosis and most effective interventions.

TABLE II. American Thoracic Society/American Medical Association Guidelines: Impairment for asthma (1993)

Score	0	1	2	3	4
Post-bronchodilator FEV ₁ (% predicted)	≥80	70-79	60-69	50-59	<50
Reversibility in FEV ₁	<10	10-19	20-29	≥30%	—
Methacholine PC ₂₀	>8	8->0.5	0.5->0.125	≤0.125	—
Medication required	None	Occasional bronchodilator	Daily bronchodilator or inhaled steroid	High-dose inhaled steroid; occasional oral steroids	High-dose inhaled steroid and daily oral steroids

Adapted from American Thoracic Society. Guidelines for the evaluation of impairment/disability in patients with asthma. Medical Section of the American Lung Association. Am Rev Respir Dis 1993;147:1056-61. Official Journal of the American Thoracic Society. © American Lung Association.

TABLE III. Classes of asthma impairment

Impairment class	Total score
0	0
I	1-3
II	4-6
III	7-9
IV	10-11
V	Asthma not controlled despite maximal treatment (use of 20 mg prednisone qd)

qd, Every day.

Adapted from American Thoracic Society. Guidelines for the evaluation of impairment/disability in patients with asthma. Medical Section of the American Lung Association. Am Rev Respir Dis 1993;147:1056-61. Official Journal of the American Thoracic Society. © American Lung Association.

At this point, the employer must be educated about NRL allergy and made aware of potential unfavorable clinical outcomes. The employer is given the opportunity to implement measures that will accommodate affected workers. Implementation of interventions that resolve work-related symptoms triggered by NRL glove exposure are in the best interests of both the employer and employees. Rarely, such interventions are not effective and workers may be advised to actively seek workers' compensation and, if necessary, rehabilitation.

Management of OA

OA is defined as variable airflow limitation and/or airway hyperresponsiveness associated with causes or conditions encountered in the workplace.⁹ In terms of work-related asthma, impairment is defined by a variety of criteria including reduced lung function (ie, FEV₁, FEV₁/forced vital capacity); the presence of hyperresponsiveness to methacholine; and requirements for asthma medications (see Table II).⁸ It must be emphasized that disability is not equivalent to impairment. Disability caused by chronic asthma is a qualitative rather than quantitative function. Information that is factored into the determination of disability caused by conditions at work included the effects of the impairment on the ability to perform activities at work or at home; the impact of the defined impairment on the physical requirements of the job; days missed from the job and job restrictions caused

by the work-related condition triggered by the causative agent or exposure.

If an HCW is confirmed to experience OA or work-related anaphylaxis, that individual is determined to have 100% impairment from performing any job that would entail significant ambient exposure to NRL protein allergens.⁸ This degree of impairment may be temporary if, as in many cases, work environments can be modified to reduce ambient NRL allergen levels to concentrations that will not trigger respiratory responses. The overall impact of interventions on the patient-worker can be assessed by serial evaluation of quality-of-life measurements that evaluate patients' perceptions of the impact of the occupational disorder on everyday activities.

Guidelines for evaluation of impairment of patients with asthma have been recommended by several professional societies including the American Thoracic Society and the American Medical Association.^{8,10} The former document includes special recommendations for evaluation of impairment and disability in workers with OA. Impairment ratings for asthma may be applicable to some cases of OA that are characterized by chronic airway obstruction. As shown in Table II, the American Thoracic Society guidelines propose that impairment be assessed by means of a scoring system based on FEV₁, degree of reversibility after bronchodilator treatment, nonspecific airway hyperresponsiveness determined by histamine or methacholine inhalation challenge testing (expressed as PC₂₀ or concentration of agonist required to decrease the FEV₁ by at least 20% from the pre-challenge baseline value), and requirements for different classes of anti-asthmatic medications. Once these data have been compiled, impairment ratings (I-V) are assigned based on a total impairment score (Table III).

Although this system is useful for chronic persistent asthma, impairment cannot be accurately quantified in many workers with OA who are asymptomatic between work exposures that trigger attacks. In such cases, an impairment evaluation becomes subjective, often requiring physicians to exercise medical judgment in determining the degree of impairment and disability related to the workplace. Methacholine testing assessed within 1 hour after leaving the workplace and workplace challenge tests may be more useful techniques for assessing impairment, especially for those workers with normal baseline spirom-

TABLE IV. Impairment of the skin

Table available in print only

etry values. It should be emphasized that OA impairment ratings are not static. In workers with OA, maximal improvement in lung function may not be realized for as long as 5 years after cessation of exposure to the inciting agent.¹¹ Therefore, re-evaluation for long-term impairment and permanent disability should be conducted 2 years after removal from the inciting work environment.⁸

Impairment ratings for evaluation of skin conditions are available in the 4th edition of the *American Medical Association Guide to Evaluation of Permanent Impairment* (Table IV). Because of the nature of NRL-induced IgE-mediated contact urticaria, clinical manifestations occur intermittently but can limit activities at work. Because urticarial eruptions resolve after discontinuation of NRL glove use, it is likely that most affected HCWs will fall under the I, II, or III impairment classes (<55% impairment). Because of the widespread availability of low-protein NRL gloves and NRL glove substitutes, permanent disability caused by contact urticaria is unusual.

Long-term outcomes of current management strategies

There is relatively little information pertaining to long-term outcomes of HCWs who have been diagnosed with NRL allergy. Kujala et al¹² reported that 32 HCWs sensitized to NRL had a decrease in Work Ability Index compared with nonsensitized workers. Glove changes were instituted in 81% of the latter group, but 18% of NRL-sensitized workers were forced to make a change in occupation because of NRL allergy.¹²

Useful data are difficult to retrieve from state workers' compensation boards. California and Michigan compile data that describe the numbers of claims in specific industries and specific occupations, but specific causative agents are not identified. The State of Ohio Bureau of Worker's Compensation lists claims by diagnostic codes. Since creation of the *International Classification of Diseases, Ninth Revision* code 989.82 for latex allergy, there have been 21 claims filed for latex allergy between 1996 and 1999; of these, 17 were approved and 3 denied. These represent a minute percentage of all claims filed in the system. For example, in 1998 there were 8 latex claims filed with the Ohio Bureau compared with 266,769 total claims filed. Review of medical and indemnity payments for 21 claims revealed that the average medical expense paid was \$493.00 (median = \$59.00) and average indemnity payment was \$3034 (median = \$0.00), indicating that, with 2 exceptions,

costs incurred by claims labeled as latex allergy were minimal (G. M. Jewell, Bureau Worker's Compensation State of Ohio, written communication, December 12, 2001). These data may underestimate the actual numbers of cases of severe latex allergy. However, it does not appear that cases labeled as "latex allergy" have incurred a large expense in the State of Ohio.

Using a detailed self-administered questionnaire adapted from and expanded from the instrument used by Liss et al,¹³ we reviewed long-term outcomes in 58 HCWs with NRL allergy participating in a National Institute for Occupational Safety and Health-sponsored study of skin prick test responses to Hev b proteins.¹⁴ In this investigation, diagnoses were based on history of work-related, reported symptoms of contact urticaria, rhinoconjunctivitis, and/or asthma in addition to sensitization confirmed by a positive skin prick test response to a nonammoniated whole NRL extract. All 10 HCWs who reported only hives when wearing NRL gloves had complete resolution of urticaria after switching to non-NRL glove substitutes; predictably, symptoms persisted in 3 others for whom no intervention was instituted. Changing to non-NRL gloves in 18 HCWs who reported NRL-related urticaria and rhinitis symptoms resulted in complete resolution of symptoms in 15 (83%).

Among 25 HCWs with nonammoniated NRL sensitivity who reported asthma symptoms, 4 (16%) were compelled to leave their occupations because of work-related symptoms. Eighteen (72%) of the latter workers noted resolution of all symptoms with a change to non-NRL gloves. Of 4 reporting anaphylactic symptoms associated with NRL exposure, 3 were no longer working in a health care facility because of NRL allergy. There was a mean 29% fall in annual income in 4 of 58 (6%) HCWs who left their jobs because of NRL allergy.

SUMMARY AND CONCLUSIONS

If NRL allergen exposure is reduced or eliminated, NRL allergy causes minimal long-term measurable impairment. This may, in part, explain the low number of workers' compensation claims received or approved for latex allergy. However, conventional measurements of impairment do not accurately reflect the degree of substantial occupational disability associated with asthma and anaphylaxis triggered by exposure to ambient NRL allergens. If workplace interventions aimed at reducing exposure are inadequate, a significant percentage of

affected HCWs are compelled to change jobs or occupations. It is clear that workers with permanent total disability caused by NRL-induced asthma or anaphylaxis can also incur loss of income. These scenarios are largely preventable, considering that the means are available for health care facilities to institute interventions that can reduce ambient exposure below levels that elicit allergic asthmatic responses.

In the entire administrative process of dealing with NRL allergy, the physician's responsibilities include documentation of sensitization, diagnostic confirmation, definition of impairment ratings and overall disability, and finally advising employers regarding effective interventions. Employers must also be encouraged to initiate institution-wide primary prevention measures that prevent sensitization and new cases. Finally, the physician expert must be an active participant in education programs aimed at informing HCWs, physicians, and administrators about the diagnosis, treatment, and prevention of NRL allergy.

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