Pseudo-Latex Allergy Associated With "Latex" Paint Exposure: A Potential Cause of Iatrogenic Disability

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Objective: *We sought to describe outcomes for three health care workers with natural rubber latex (NRL) allergy reporting illness after exposure to latex paint.* ***Methods:*** *We undertook a retrospective review of medical and occupational histories, diagnostic, treatment, and work recommendations. Outcomes included lost time, workers compensation indemnity costs, and return to work.* ***Results:*** *None of the paints contained NRL. Cases 1 and 2 initially were misdiagnosed as suffering allergic reactions to NRL, resulting in 7 and 23 months lost time, $15,790 and $139,000 indemnity costs, respectively, and both failing to return to work. Case 3 was correctly diagnosed as not exposed to NRL, with only several lost days, no indemnity costs, and continued to work.* ***Conclusions:*** *The failure to recognize that synthetic paints do not contain NRL can lead to misdiagnosis, inappropriate exposure, and work avoidance recommendations and iatrogenic disability.* (J Occup Environ Med. *2006;48:83–88*)

Latex glove-related health complaints comprise three broad categories: irritant dermatitis, which is related to skin dryness, frequent hand-washing, and various irritants in soaps and gloves; allergic contact dermatitis (type IV delayed hypersensitivity), which most frequently is related to thiurams and other nonlatex rubber accelerators and additives; and natural rubber latex (NRL) allergy (type I immediate hypersensitivity). The latter may manifest as contact urticaria, rhinoconjunctivitis, asthma and, occasionally, as anaphylaxis. Thus, NRL allergy is the most serious concern to health care workers and their employers.

NRL is derived from the rubber tree, *Hevea brasiliensis*. Various proteins account for approximately 2% of raw NRL sap and include the antigens responsible for causing NRL sensitization and allergy.[1] Reports of NRL allergy increased substantially with greater latex glove use and augmented diagnostic recognition during the late 1980s and 1990s. The prevalence of NRL sensitization among health care workers ranges from 5% to 17% as estimated by skin prick or specific IgE antibody testing.[2–4]

Fortunately, powder-free latex gloves are effective in reducing NRL exposures in areas where they have been substituted for powdered gloves.[1,5–10] In addition, the introduction of powder-free gloves has been demonstrated to decrease markers of NRL sensitization over time in NRL sensitized health care workers.[10,11] Moreover, among 1959 health care

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workers employed in three facilities using primarily nonpowdered gloves, a recent study using a symptom questionnaire and specific IgE antibody testing found the prevalence of NRL sensitization and NRL allergy to be only 1.8% and 0.6%, respectively.[12]

Apart from gloves, NRL-sensitized persons have been cautioned about the ubiquitous presence of NRL-containing products in the workplace and home, as well as, cross-reactions with various foods.[1,13,14] Within a 1-year period, we evaluated three nurses with pre-existing NRL allergy who reported "allergic reactions to latex" after "latex" paint (actually containing non-NRL synthetic polymers) was applied in their work areas. In two cases, the treating physicians' failure to recognize that the paints did not contain NRL led to misdiagnosis, inappropriate exposure, and work avoidance recommendations and iatrogenic disability.

Materials and Methods

Cases

Two of the nurses came to our attention when third parties requested independent medical examinations regarding workers compensation claims. The third case was identified when she consulted an employee health service for an alleged allergic reaction after an exposure to latex paint at work.

Data Collection

Past and present medical and occupational histories were obtained from available medical records, direct interviews, and physical examinations. Long-term outcomes, including lost time from work, workers compensation indemnity costs, and return to work, were obtained from responsible claims administrators for each respective case.

Exposure Assessment

Assessment for possible exposure to NRL during the alleged workplace allergic reactions consisted of review of all available Material Safety Data Sheets (MSDS) for each painting exposure. In addition, product information personnel at each manufacturer were contacted and queried specifically about the possible presence of NRL in each of their involved products.

Results

All three affected health care workers were women employed as registered nurses, ranging in age from 44–49 years, who had been working in their present assignments between 1 and 3 years. All had a pre-existing history of NRL allergy and wore nonlatex gloves at work. All three facilities were using powder-free gloves for other employees.

Case 1

A 44-year-old, nonsmoker began work as a registered nurse in 1982. In the late 1980s, she complained of contact urticaria, rhinitis, and eye swelling associated with latex glove use. Latex allergy was confirmed by serologic testing. Around 1997–1998, because of the progression of her symptoms, she left the hospital to work as a home health care nurse.

In 2000, she resumed work as a medical/surgical nurse at her original hospital. She worked only weekends, carried her own gloves, and reported no incidents for 2 years. In August 2002, she accidentally put on latex gloves and experienced tongue and perioral tingling and hives on her hands. Initially, she self-treated with an antihistamine but over the next several days complained of dyspnea and wheezing. She was evaluated by her private pulmonologist and treated with systemic steroids. Although she returned to work in October 2002, she stated that she was not tapered off systemic steroids until January 2003 because of dyspnea and reported steroid myopathy.

In February 2003, her assigned unit was being painted, and she complained of tongue tingling and lip swelling upon smelling the paint (Table 1). She presented to urgent care stating that she was latex allergic with a history of anaphylactic episodes in the past and acute exposure to latex paint. Despite the lack of hypotension, bronchospasm, stridor, definitive urticaria or angioedema, she was treated for presumed latex anaphylaxis with epinephrine, systemic steroids, and antihistamines. The urgent care physician's notes state: "Allergic reaction to latex involving mucous membranes with history of anaphylaxis. Given severity of reactions in past, unavoidable to use steroids." After subjective improvement, she was discharged home and asked to follow-up with her pulmonologist.

Her subsequent course is summarized in Table 2. Despite several communications from the hospital's chief of occupational medicine, who explained that the paint did not contain NRL, the employee's pulmonologist continued to believe that the paint contained NRL and that the correct diagnosis was anaphylaxis and continued to treat her with systemic steroids. He also kept the nurse out of work, despite the hospital's commitment that it would provide her with a safe environment.

In April of 2003, an independent medical examination confirmed that neither product used to paint the employee's unit contained NRL by review of the MSDS and telephone interviews with the products' manufacturers. Additionally, although the employee claimed to have suffered other anaphylactic episodes before the 2003 incident, she admitted that she had never used her epinephrine autoinjector nor received emergency treatment for the previous episodes. She stated she did not tolerate medications well and felt her asthma inhalers made her breathing worse. Despite no current respiratory or allergic symptoms, her pulmonologist maintained her on systemic steroids. She had also been seen by an endocrinologist, whose workup was reportedly consistent with steroid myopathy and steroid dependence. These records were unavailable. Physical examination was remark-

TABLE 1
Exposure Incident and Presenting Characteristics

Case	1	2	3
Work setting	Medical/Surgical unit	Dialysis unit	Psychiatric unit
Workplace event	Paint application	Paint application	Paint application
Point of initial evaluation and care	Urgent care	Employee health clinic	Employee health clinic
Presenting complaints	Latex allergy reaction with tongue tingling, lip "swelling," and facial "warmth"	Latex allergy reaction with blotches on the head and neck, nervousness, pruritis, vague respiratory "sensation" (no shortness of breath)	Latex allergy reaction with ears red, itchy and "swollen"?
Description of initial findings	"Nervous" appearing, but no stridor or respiratory distress. Afebrile. BP 133/86, HR 86 RR 18, RA O2 sat 99%. HEENT- face flushed, "mild swelling lower lip, no obvious mucosal swelling within oropharynx" Chest: clear to auscultation Skin: improving red raised rash, "mottled" hands, distal pulses: intact	"Uncomfortable"; no respiratory distress, no stridor, Vital Signs not recorded. Chest: clear to auscultation Skin: "hives" neck	No respiratory or other distress. Afebrile, BP104/70, HR 76, RR 20 Oropharynx- unobstructed, mild erythema. Chest: clear to auscultation Skin: ears with mild "transient" erythema, no hives; chest, back, arms without hives
Initial impression	Latex allergy reaction to paint	Allergic reaction to paint fumes	No exposure to natural Rubber latex
Initial treatment	Intravenous epinephrine, steroid, and antihistamine, beta-agonist nebulizer	Oral antihistamine	Reassurance, education on the absence of NRL in "latex" paints

TABLE 2
Follow-up Care and Work Outcomes

Case	1	2	3
Follow-up care	Pulmonologist	Occupational medicine specialist in employee health service, Allergist	N/A
Work recommendation	Stay out of work	Stay out of work	Return to work
Follow-up impression Employee health service	No exposure to NRL	Latex allergy reaction to latex-containing paint	N/A
Follow-up impression: Treating physician	Latex allergy reaction to latex-containing paint	Latex allergy reaction to latex-containing paint, underlying severe latex allergy	N/A
Follow-up treatment: treating physician	Continued treatment with systemic steroids and continued avoidance of hospital environment	Continued avoidance of hospital environment	N/A
Medical complications	Reported steroid myopathy, steroid dependence	None	None
Lost time from work	7 mo	23 mo	3 d personal leave
Workers compensation indemnity losses	$15,790 Settled for closed period without liability	$139,000 Cumulative losses and lump sum settlement accepting liability	$0 No Claim Filed
Current work status	Did not return to work at original employer, unknown if working elsewhere	Did not return to work at original employer, unknown if working elsewhere	Working full-time, same employer

able only for Cushingoid facial features. Long-term outcome of the case is summarized in Table 2. After 7 months out of work, she accepted a settlement of $15,790 for that closed period and did not return to work with the hospital.

Case 2

A 47-year-old former smoker began work as a nurse in 1976. She reported latex allergy dating back to at least the 1980s. Past allergy testing was positive for a number of indoor and outdoor aeroallergens, bees, and shellfish. She also reported penicillin and egg allergy, as well as a previous anaphylactic episode due to contrast dye. She began working at her current employer per diem in 1999 and eventually became a full-time dialy-

sis nurse. Additionally, she worked part-time at a second dialysis facility.

In July 2002, the dialysis unit was being painted and upon entering the area, she immediately complained of skin "blotches" on her face and neck (Table 1). She presented to the hospital's employee health department, where she was described as scratching herself with some skin erythema and "hives around upper trunk and neck." She denied shortness of breath or dyspnea. No documentation of the patient's vital signs could be located, but there was no objective evidence of anaphylaxis, upper airway compromise, or bronchospasm. Her lungs were described as clear to auscultation with good air exchange. The treating provider diagnosed an allergic reaction to paint fumes. The employee was sent home from work without acute treatment and prescribed an antihistamine.

Her subsequent course is summarized in Table 2. Two days after the initial event, the employee again reported to her employee health service for new exposure to painting activity. The provider instructed her to remain out of work until a follow-up visit with an occupational medicine specialist. This specialist reviewed the MSDS sheets of the paint and incorrectly concluded that the paint contained NRL, presumably when he noted the paint contained "vinyl acrylic latex." Specific IgE testing confirmed pre-existing NRL sensitization. Pulmonary function studies were reported as normal.

The occupational physician's impression was latex allergy caused by paint exposure, and he referred her to an allergist. The allergist also diagnosed latex allergy under the assumption that the paint contained natural rubber latex. The employee returned to work for 2 weeks but reported recurrent paint exposure. Despite the fact that none of the paint exposures had caused serious illness or had required significant medical treatment, she was again removed from work and instructed to remain out for 6 months. She was told to restrict herself to "latex-free" environments because she was extremely sensitive to latex and that "latex-safe" environments would be insufficient. In November 2002, she was sent to a pulmonologist for an independent medical examination, who noted the exposure to latex paint and concurred with the diagnosis of latex allergy. The independent examiner likewise recommended restriction to a "latex-free" work environment.

In October 2003, a second independent medical examination demonstrated that none of the caulks and paints used on the employee's unit contained NRL as determined by review of the MSDS and telephone interviews with the products' manufacturers. She was not working and remained on Worker's Compensation. Nonetheless, she was asymptomatic and reported an active lifestyle without limitations so long as she was not exposed to latex. Her only medication was an antihistamine on an as needed basis. Her physical examination was unremarkable. Long-term outcome of the case is summarized in Table 2. After 23 months lost time and indemnity payments of $79,000; she did not return to work, and her case was settled for an additional $60,000.

Case 3

A 47 year-old nonsmoking nurse was diagnosed with latex allergy after an anaphylactic reaction to a tampon around 1989. Afterwards, she carried a prophylactic epinephrine autoinjector and avoided latex. In 2003, she began working on a psychiatric unit for her current employer, who restricted her from wearing NRL gloves. In April 2004, she presented to her employee health service with complaints of bilateral ear pruritis, erythema, and lip edema along with nasal congestion after "latex" paint exposure on her unit (Table 1). She denied shortness of breath. Physical examination showed normal and stable vital signs, a patent upper airway, clear lungs, and the absence of urticaria or other significant dermal reaction.

The employee was immediately counseled and educated by the medical director of employee health regarding the absence of NRL in latex paints. The medical director promised to confirm the lack of NRL exposure by providing the MSDS, telephoning the products' manufacturers, and providing educational information. Although she refused to return to work on the day of the incident, she returned several days later without incident. Several months later more painting was scheduled on the nurse's unit, and she elected to take 2 weeks of personal leave. Because she requested this leave through her personal physician, the physician was educated regarding latex paints and the difference between synthetic polymers and NRL. The employee has continued to work for the same employer on the same unit without further incident (Table 2).

Discussion

In each of our cases, the involved paints contained synthetic polymers and resins, and none contained NRL. Because these paints are referred to as "latex" paints, many persons, including some clinicians, assume these products contain NRL. The first two cases demonstrate that failure by treating physicians to carefully consider the actual exposures can lead to misdiagnosis, unnecessary treatment and removal from work with iatrogenic disability. Physician advice regarding return to work is one of the most important determinants of whether an employee actually returns.[15] Once a treating physician has repeatedly reinforced an employee's perception that he/she has incurred NRL exposure through paint and that they cannot work, it is very difficult, if not, impossible to convince the employee otherwise. The result is what Aronoff and colleagues have termed "disability conviction."[15]

Consequently, outcomes for cases 1 and 2 were unfavorable: failure to return to work at highly skilled jobs and, in case 1, medical complications. Outcomes for their employers also were unfavorable, including medical and indemnity costs as well as the need to find replacement workers. Case 1 cost significantly less than case 2 because the employer's medical director immediately recognized the paint did not contain NRL and arranged a definitive independent opinion at an earlier stage. The third case, where return to work was successful and costs were negligible, suggests that negative outcomes can be minimized by prompt investigation of the actual exposures, the avoidance of unnecessary treatment, and assertive education of the patient and their personal physician.

With the exception of a few specialized waterproofing products, paints currently in use do not contain NRL.[16] "Latex" paint is generally made of various combinations of synthetic petrochemicals, such as vinyl acetate and various acrylates, epoxy, neoprene, polyurethanes, or styrene acrylics to form a polymer matrix.[17–19] Educational statements reviewing the absence of NRL in "latex" paint are available from various groups, including the Canadian Allergy, Asthma and Immunology Foundation[20]; the American Academy of Allergy, Asthma, and Immunology[16]; the American Latex Allergy Association[21]; the National Paint and Coating Association[18]; and specific manufacturers.[19] These educational materials can be invaluable in informing and reassuring concerned or skeptical employees or treating physicians.

Notwithstanding, misconceptions regarding latex paint are likely to be common. We encountered such beliefs among three nurses, several of their treating physicians, and an independent examiner within a 1-year period. Therefore, we believe that more widespread dissemination of this information to health care workers and occupational, allergy, and pulmonary physicians is needed. Furthermore, whenever painting is scheduled in a health care facility, a proactive approach should be taken. This should include the selection of products that do not contain NRL, informing employees that painting with non-NRL containing paints will take place, and making available MSDS and educational statements regarding the absence of NRL in paints beforehand.

The potential causes of the reported symptoms in our series include allergy to some substance other than NRL, irritation, or anxiety with somatic manifestations. We believe that anxiety is the most likely explanation with the mechanism being "reactivation of an emergency/fear reaction"[15] triggered by the paint odor. Persons with a previous history of exposure-related illness may have heightened environmental awareness and apprehension and markedly greater symptom responses (symptom amplification) upon odor detection.[22–24] The nurses' anxiety was compounded by their belief that "latex" paints contained NRL and thus, their conclusion that a serious physical reaction might ensue. Investigators have noted excess physical symptoms in other situations where environmental exposures were anticipated, but did not actually occur, and have hypothesized that odors may serve as sensory cues for symptom manifestation.[22] Further support for this explanation comes from case reports of "odor-triggered panic attacks,"[25–27] and provocative challenge studies of patients with idiopathic environmental intolerances.[24]

Once an employee with latex-related complaints has been medically removed from work and enters the workers compensation system, significant indemnity and other legal costs can ensue even when the diagnosis is uncertain or eventually proves to be mistaken. A Michigan health care insurer reported an average cost of $21,402 per lost-time latex/glove case, and an individual case whose costs exceeded $220,000 in the first year without being confirmed as true NRL sensitivity.[28] cases 1 and 2, in our series, cost their employers over $15,000 and $139,000, respectively. They are representative of outlier cases that drive overall costs higher. For example, in Minnesota, the mean cost of a lost time latex case was more than $8000, but 78% of lost time latex cases cost less than $2000 and 89% cost less than $10,000.[29]

Systematic strategies that ensure appropriate diagnosis and encourage return to work can greatly minimize the negative consequences of a latex/glove-related claim. The Michigan Health & Hospital Association Service Corporation instituted case-management for all such claims, with a diagnostic protocol for the confirmation of NRL allergy including NRL-specific IgE serology, NRL skin-prick test and, if needed, serial spirometry during return-to-work evaluations.[28] Using this protocol, only 26% of latex/glove related claims were confirmed as having NRL sensitivity, and 78% of these confirmed NRL claims either lost no time from work or were successfully returned to work. Additionally, this insurer was able to decrease the average cost of all lost time NRL/other glove claims from $38,077 in 1996 to $4298 in 2000.

A careful history and rigorous diagnostic approach in the evaluation of potentially NRL-related complaints also are critical from a clinical standpoint. For example, Condemi[13] reported on a patient with NRL allergy referred because of anaphylaxis to "latex" paint. Although the patient had suffered a convincing episode of anaphylaxis and was exposed to fresh paint, a thorough evaluation showed that the paint did not contain NRL. Further investigation revealed that the patient had eaten a kiwi fruit preceding her illness and subsequently demonstrated a positive skin-prick test to fresh kiwi. Obviously, the perpetuation of the mistaken diagnosis of paint allergy could have led to recurrent and potentially fatal kiwi anaphylaxis.

In summary, during the evaluation of potential allergic complaints among health care workers, not all persons with glove-related complaints have true type I NRL allergy. Additionally, in persons with confirmed NRL allergy, some symptom episodes may result from factors other than NRL exposure. In cases not involving NRL such as painting, a thorough and prompt investigation of the actual exposures coupled with assertive education of the patient and their personal physician can reduce or avoid negative outcomes. Advice and reassurance from physicians that encourages return to work can prevent iatrogenic disability.[15,28] Most health care workers with NRL allergy can continue to work or return to work in a health care setting with appropriate education, medical management and simple workplace modifications.[28,30] These include the avoidance of latex glove use and the use of powder-free gloves by coworkers. Finally, we strongly encourage more widespread education regarding the absence of NRL in paints.

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