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Latex Allergy in Clinical Practice

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Abstract

A continuous exposure or contact to latex products may sensitize the human body by causing mild to fatal reactions. Despite the availability of the literature, medical personnel are still unaware of the implications of the use of latex materials. The increased awareness to prevent the transmission of infectious blood borne pathogens has led to increased usage of medical gloves among health care workers. This increased usage of medical gloves, along with improved methods in diagnosing latex allergy, has been the reason for the rise in the number of reported cases. This has led to recognition of latex allergy as a serious medical concern. Patients in high-risk groups must be assessed carefully, so that appropriate protocols can be used to protect them from contact with latex.

Keywords: *Allergic reactions, gloves, healthcare workers, latex allergy, protocols*

Introduction

The word “latex” refers to natural rubber latex (NRL), the milky sap from the rubber tree *Hevea brasiliensis*. The rubber tree is native to Brazil, but the majority of plantations from which commercial latex is currently harvested are located in the Pacific Rim-Malaysia, Indonesia, Thailand, and Vietnam. Latex is a generic term meaning water emulsion, or a liquid dispersed within another liquid, NRL is composed of rubber particles and water. NRL contains more than 250 different proteins, but few are found to be allergenic.

Rubber's long history of use dates back to the Indians of south and Central America, before the arrival of Columbus in the new world. Commercial applications began in 1839 Europe, when Charles Good Year developed the process of vulcanization, which alters the properties of latex and gives it elasticity, strength and stability.

Rubber gloves had been introduced into surgery by 1890 by Dr. William Halsted, an American surgeon.[1] 'Today natural rubber latex gloves are indispensable to the healthcare environment. They provide the most effective barrier to blood-borne pathogens for both healthcare workers and patients.

Chemicals used during the production of NRL gloves, as well as frequent handwashing, harsh detergents and incomplete drying, can irritate the skin of our hands. Reactions to wearing gloves can vary from irritation, which is common and easily managed, to allergic reactions. It is very important to determine the precise cause of a reaction so that it can be treated appropriately. [Table 1](#) shows spectrum of reactions to wearing gloves.[2]

Risk Factors

Patients in high-risk groups must be assessed carefully, so that appropriate protocols can be used to protect them from contact with latex.[3]

Spina bifida patients They usually require surgery within the first days of life, in addition to frequent orthopedic, urologic, and neurosurgical procedures, multiple diagnostic radiology and laboratory tests, and daily programs to maintain bladder and bowel continence.

Individuals with congenital urinary tract anomalies, or multiple surgeries or catheterizations These patients are at high risk due to significant mucous membrane exposure to latex through surgeries and routine catheterization.

Atopics (Individuals with a genetic predisposition for allergies) They have a genetic predisposition to allergic reactions like asthma, allergic rhinitis, dermatitis, or eczema, if an individual has many different allergies, he or she is at higher risk for experiencing as allergic response to NRL.

Persons with allergies to certain foods Immunoblot inhibition has demonstrated cross-reactivity between IgE antibodies to several proteins in NRL and to certain foods, especially bananas. In one study, half of the NRL allergic patients experienced symptoms after eating banana, and 35% had a positive skin test to fresh banana. Other food allergies mentioned less frequently, but which might place an individual at higher than average risk, include mangos, figs, papayas and pineapple.[4]

Healthcare workers Healthcare workers were initially thought to be at higher risk than the general population because of their consistent exposure to latex gloves. Certain studies suggest that this may not be the case. For example, in two studies done in 1996 among specific populations of healthcare workers, 6% and 8.8% tested positive for latex-specific IgE antibody.[5,6] These figures compare very closely with the 6.4% and 6.7% in studies of groups representative of the general population. This suggests that the incidence of latex sensitivity

in healthcare workers is about the same as in the general population.

Various Test to Identify Latex Allergy

Routine testing of all patients or workers is expensive. Testing should also be made available to those individuals who do not qualify as high risk, but who ask to be tested.

Patch testing Patch tests are used to differentiate irritant contact dermatitis from allergic contact dermatitis (Type IV hypersensitivity reactions).[7] The test is usually read at 2 and 3 days in order to identify type IV hypersensitivity reactions, which normally peak in intensity at 48 to 72 hours after exposure. Irritant contact dermatitis can be distinguished from allergic contact dermatitis by the timing of onset and duration of the skin reaction.[8]

Skin prick testing It is a quick and inexpensive way of screening and diagnosing Type I NRL allergy. For a skin prick testing (SPT), drop of latex extract diluted in saline is placed on the skin, and the skin is gently pricked with a needle. If an individual is sensitized, a wheal-and-flare reaction will develop in 15-20 minutes. The reaction is graded according to the diameter of redness and swelling at the test site. The advantage of SPT is its availability, low cost, quick results and sensitivity.[8] The test must be performed by experts who are knowledgeable both of the testing technique and in interpreting the results. Emergency resuscitation equipment, emergency drugs and personnel should be available to treat any possible adverse reaction. SPT may be unsuitable for pediatric patients who are needle-phobic, for patients receiving specific medications that may interfere with testing (e.g., immunosuppressant therapy) and for patients with severe dermatitis

“Use” tests (tests using the allergic substance) or pulmonary inhalation tests Use tests with latex gloves or pulmonary inhalation tests has been suggested as decisive step to judge whether a clinically relevant NAL allergy exists. The test is difficult to standardize but that are sensitive, helpful diagnostic method.

A “use” test is performed on wet hands using a non-latex glove as a control. The NRL glove is first exposed to only one finger for 15 minutes; if this preliminary test is negative, the whole hand is exposed for an additional 15 minutes. The test frequently produces contact urticaria if performed with highly allergenic gloves, and has caused as anaphylactic reaction in a patient with severe hand eczema. To avoid false positive results in milk-allergic subjects, the “Use” test should be performed with a glove brand without casein.[8,9]

In vitro immunoassays They are safe, sensitive, and specific, but more expensive and not as readily available as SPT. *In vitro* testing is done on a blood sample and has the advantage of not exposing the individual to the allergen. A positive test indicates sensitivity to latex protein, but does not mean that the individual will necessary experience a clinical reaction to latex.[2]

Creating a Safe Healthcare Environment

The ideal healthcare environment is one that minimizes the risk of hypersensitivity reactions to latex products, without exposure to blood borne pathogens. Achieving this goal requires a

multi-faceted approach.

Education

Educating staff about the phenomenon of latex sensitivity, including its incidence, risk factors, identification, and management, is a key component of managing the environment. An educated staff is also more likely to make appropriate decisions about the choice of latex products and alternatives to be used in various situations, including patient care.

Protocols for Assessment and Management of Patients and Staff

Both patients and staff, especially those at risk, who test positive for latex allergy, or who demonstrate allergic reactions should know what items to avoid, should be aware of alternatives to products containing latex, and should know how to manage allergic reactions, including emergency management of anaphylaxis.

Assessment of Staff and Patients

The staff assessment protocol should identify the procedures that will be used to assess latex allergy. If screening for latex sensitivity is available, the protocol should indicate the criteria for participating in the screening, when the screening will be done, and how the results will be handled. A sample personnel protocol is provided in [Table 2](#).

All patients should be screened for latex allergy during the assessment process.[\[10\]](#) The diagnosis of NRL allergy is based on a thorough clinical history to identify the presence of any risk factors or previous reactions, as well as on laboratory testing. Case reports indicate that traditional preoperative histories often do not elicit the information needed to determine whether a patient is allergic to latex. When questioned more thoroughly, patients may report reactions to balloons or gloves, even though they had not associated their reactions with latex in the product. Protocols should identify the specific information needed to determine the patient's risk of reaction to latex, and the teaching that will be done for patients in the different categories. Even a careful and complete history will not identify all persons at risk. [Table 3](#) shows list of some of the most common latex containing medical devices and household items along with appropriate substitutes.

Preoperative Prophylaxis

Because of the difficulty in identifying all products that contain latex, the lack of latex-free alternatives for some products, and the possibility of human error, preoperative prophylaxis may be recommended for individuals with latex allergy. However, there are no studies that document the effectiveness of this approach,[\[6,11\]](#) and anaphylaxis has occurred despite pre-treatment. [Table 4](#) illustrates a sample Protocol for Latex sensitive-surgical patients.

[\[2,7,11,12\]](#)

Managing Anaphylaxis

The recommendations of The American College of Allergy, Asthma and Immunology and the American Association of Nurse Anesthetists, is outlined in Tables 5 and 6.[7]

Glove Use Guidelines

The variety of physical properties of different glove materials allows individuals to select the appropriate glove for a given situation. For example, waste handlers can wear thicker vinyl gloves, and housekeeping personnel can wear reusable gloves that can be washed and dried. Healthcare workers need to know when it may be appropriate to double-glove and should not use sterile gloves when a non-sterile exam glove is sufficient and more cost-effective.[7]

Low-protein Gloves

Since the late 1980s, glove manufacturers have responded to concerns about latex allergy by working hard to measure and reduce the level of latex proteins in medical devices. The FDA permits manufacturers of NRL gloves to state the protein levels of their gloves on package labels. A protein labeling claim below 50 µg/g is not permitted, due to variability in test results below this level. It is important to recognize that as little as 50 µg/g of latex may still cause a reaction.[8] Thus, 'low-protein' gloves are not appropriate for a latex-free environment.

Powder-free Gloves

The inside of most latex gloves is coated with cornstarch to enable them to be donned more easily. This cornstarch itself is not allergenic, and no studies have confirmed the hypotheses that healthcare workers will develop latex sensitivity from exposure to allergenic proteins bound to airborne cornstarch. Even though a connection has not been demonstrated there have been recommendations by some that only powder-free gloves be used in healthcare settings.

Non-latex Gloves

Synthetic gloves are the only gloves suitable for someone who has an allergy to latex or who is treating a patient with a latex allergy. In high-risk setting, a latex-free environment might be considered. For patients with documented latex allergies, direct mucosal and parenteral exposure to latex during medical procedures is especially risky.[3] These individuals should be protected from contact with latex gloves and other latex products.

Conclusions

To ensure safe practice, healthcare professionals must understand the source of latex allergies and must follow precise guidelines when caring for allergic patients. Educating all healthcare workers, the community, patients, and their families about this allergy is important to facilitate awareness, recognition of allergic responses, and to provide appropriate treatment. The most fiscally responsible approach is to base decisions on factual information; provide a latex-free environment for those who are truly allergic and encourage proper skin

care avoid unnecessary irritation.

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Footnotes

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Figures and Tables

Table 1

Spectrum of reactions to wearing gloves

Mechanical/Irritant contact dermatitis	Type IV hypersensitivity	Type I hypersensitivity
Not immunologically mediated	T cell-mediated	IgE-mediated; circulating antibodies
Localized to area of contact	Localized symptoms; may spread	Systemic symptoms
Redness; itching; dry, crusted lesions	Redness; irritation; eczema; urticaria (hives)	Urticaria (hives); rhinitis (hay fever-like symptoms); asthma-like symptoms; anaphylaxis
Due to friction, chemicals (in anti-microbial or gloves), or simply to occlusion	Due mostly to chemicals, but may be due to latex proteins	Due to latex proteins
Uncomfortable	Significant discomfort	Can be life-threatening

Based on steelman²³

Table 2

Latex sensitivity protocol^[7]

1. Provide comprehensive education on latex allergy for all employees at risk for becoming sensitized through frequent exposure to latex. Provide overview education for all employees.
2. Screen all employment candidates for latex sensitivity during the interview process and during the pre-work history and physical. If appropriate, offer additional testing to verify the diagnosis.
3. Offer testing to employees whose reaction to glove-wearing suggest a latex allergy. Extend the opportunity for testing to any employee who requests to be tested.
4. Document the test results in the individual's record and notify Employee Health and all other appropriate departments of the presence of a latex allergy. Follow facility protocol for managing an employee with a health problem.
5. Ensure that the employee can recognize the signs and symptoms of an allergic response and knows to report the development of these symptoms.
6. Counsel the worker regarding work restrictions, if any
7. Provide appropriate alternative (synthetic) gloves. Consider low-protein or synthetic gloves for other individuals in the room as well.

Table 3

Latex-containing products and alternatives[7,11]

Latex item	Non-latex item
Adhesive bandages	Sterile dressing with plastic tape
Adhesive tape	Plastic tape, paper tape, 1 inch rolled cotton gauze
Adhesives	Non-latex adhesive
Anesthesia circuits	Neoprene circuits, bags
Balloons	Mylar balloons
Bite blocks	Silastic bite blocks
Blood pressure cuff tubing	Rolled cotton batting on areas of contact with patients' skin
Catheter, Foley	Silastic Foley catheter
Catheter leg bag straps	Velcro fastening tape straps
Crutch axillaries and hand pads	Cover with cloth
Disposable diapers, rubber pants	Cloth diapers
Drains, Penrose	Silicone tubing
Electrode pads	Non-latex brands
Esmarch bandages	White cotton Ace bandages
Finger cots	Non-latex glove fingers
Gloves, examination	Vinyl or nitrile gloves
Gloves, surgical	Neoprene, tri block copolymer, nitrile gloves
IV tubing rubber stoppers	Three-way stopcocks on IV tubing
Masks, molded with elastic band	Other types of surgical masks
Medication vials with rubber stoppers	Use ampoules if possible
Name bands	Non-latex name board
Needle counting systems	Remove foam stick pad and use Magnetic side
Pacifiers	Plastic or silicone pacifier
Rubber bands	String
Sheets	Disposable under pads
Solution bag injection port	Tape injection ports
Stethoscope tubing	Place cloth around latex
Syringes	Glass syringes; Latex-free syringes
Tourniquets	Wrap with stockinet or wrap over clothing
Toys	Plastic, cloth, or vinyl toys
Wheelchair cushions	Cover with cloth
Wheelchair tires	Wear gloves propel chair

Table 4

A Sample protocol for latex sensitive-surgical patients[2,7,11,12]

-
1. Patient with known latex allergy should be scheduled as the first case of the day when possible.
 2. Screen all patients for latex allergy during the preoperative interview.
 3. Verify suspected allergies with laboratory testing, if appropriate.
 4. Notify all team members the attending physician and all appropriate departments including surgery.
 5. Communication is essential. Inform all involved personal (e.g., Surgical Anesthesia, Post Anesthesia Care Unit (PACU), Radiology, Pharmacy and Laboratory).
 6. Remove all latex-containing product from the patient's vicinity.
 - Allergic reaction can be provoked from indirect contact as well as direct contact e.g., being touched by someone who has worn latex glove (Hand washing is essential).
 7. Using the latex-free product and alternative. Ensure a latex-free environment in which there is no latex glove used by any personnel, and no patient contact occur with other latex devices (e.g., Catheter condom, adhesives, tourniquet, or anesthesia equipment).
 - Cover latex port on IV tubing and bags with stickers. Do not use rubber IV injection port or rubber medication stoppers. Instead use three-way stopcocks and dispense medication from a glass ampule. If ampules are not available, remove the stopper and draw medication directly from an opened multi-dose vial.
 - use glass syringes or plastic syringes with latex-free plungers.
 - ensure that the table pad(s) and positioning devices are intact, inner foam content may contain latex proteins.
 8. Clearly label the patient chart, patient identification bracelet, and any laboratory and radiology slip with the words LATEX ALLERGY.
 9. If latex-related complication occurs during or after the procedure, document thoroughly.
 10. Notify the PACU by phone about the patient's latex allergy before the patient's arrival.
 11. Educate the patient and family regarding their risk for latex reaction and ways of avoiding latex at home, at school, and at work place.
 12. Communicate with care-givers who will attend the patients postoperatively (e.g., Hospital staff, health nurses).
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- PACU: Post anesthesia care unit

Table 5

ACAAI Recommendations for anaphylaxis management[7]

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1. Administer epinephrine, diphenhydramine, and salbutamol (If patient is conscious and wheezy).
 2. Place patient in head-down position.
 3. If patient has cardiovascular or respiratory symptoms, administer oxygen by latex-free nasal cannula.
 4. Call for immediate assistance from ward and arrange transfer to emergency room. Do not leave the patient. Ensure a patient airway. Monitor vital signs. Initiate cardio pulmonary resuscitation if required. Repeat epinephrine every 10 minutes until the patient is transferred, if experiencing significant symptoms, indicating a need for further assistance.
-

ACAAI: American college of allergy, asthma and immunology

Table 6

AANA recommendations for anaphylaxis management[7]

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1. Remove latex agent, if possible. Do not delay immediate emergency therapy.
 2. Stop treatment/ procedure.
 3. Support airway, administer 100% oxygen with latex-free bag/ mask.
 4. Start intravascular volume expansion with Ringer's lactate or normal saline.
 5. Administer epinephrine. May need to repeat dose or give subcutaneously or by continuous infusion. Have all drugs readily available for timely administration.
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AANA: American association of nurse anesthetists

