Safety in the OR

# latex allergy

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**EDITOR'S NOTE** *This is the first of two articles discussing latex allergy. In this issue, the author covers general information regarding latex allergy and latex gloves. In a follow-up article, specific information regarding treatment of the latex allergic patient will be presented. We would also like to draw readers' attention to the AST web site www.ast.org, where this entire article will be reprinted, along with supplemental tables and references.*

Every day individuals in hospitals confront situations that compromise their safety. Most problems can be seen (ie smoke, chemicals, needle sticks, spills, etc), but occasionally an event occurs that is unnoticeable yet potentially deadly. Natural rubber latex allergy (NRLA or latex allergy) is one of the hidden dangers for hospital employees and patients (Figure 1). It is a critical problem that results from latex use in surgery, on the medical floors, and in dietary and support departments, such as radiology, physical therapy, laboratory, and pharmacy.

Latex allergy has recently received attention for several reasons: improved reporting systems, increased usage (more than 15 billion pairs of gloves annually), and heightened awareness of the allergy. The key to the treatment of latex allergy is education.

## What is latex and where does it come from?

Most latex originates in Africa and Southeast Asia from the milky fluid of the Hevea brasiliensis tree. Latex flows inside latex ducts, which are located outside the cambium, the layer of the tree where growth occurs. When the duct is scored, a milky white fluid flows from the cut into a cup depositing up to 1.7 ounces of solid rubber (Figure 2).

Two types of natural rubber latex are harvested: solid or liquid. "Cup lump" forms a solid mass in the bottom of the cup and on the trees. This type undergoes vulcanization—a process which uses high temperatures to produce structural changes in the latex that result in a substance with elasticity, strength and stability. Individuals who suffer from latex allergy are actually allergic to the proteins found in natural rubber, which are killed by this intense heat.

The second type is liquid latex, which requires a stabilizing agent, usually ammonia, be added to the liquid latex at its harvest to prevent coagulation. Low ammonia products may also have other preservatives, such as sodium pentachlorophenate, tetraethylthiuram, and zinc oxide. Heat is not used to process liquid latex; therefore, the remaining proteins stimulate the allergy.

## Who is at risk?

Individuals experience allergic reactions to latex because a foreign molecule, or antigen, contacts host antibodies and/or effector cells. Anaphylaxis is a systemic, life-threatening reaction characterized by severe hypotension, bronchial spasm and a rash. According to the Anaphylaxis Foundation of Canada, "An anaphylactic reaction is caused by the sudden release of chemical substances, including histamine, from cells in the blood and tissues where they are stored. The release is triggered by the reaction between the allergic antibodies (IgE) with the substance (allergen) causing the anaphylactic reaction. This mechanism is so sensitive that unbelievably small quantities of the allergen can cause a reaction. The released chemicals act on blood vessels to cause the swelling and low blood pressure, and on the lungs to cause asthma."

Individuals at risk of acquiring latex allergy belong to one of two categories: medical exposure and occupational exposure. Medical exposure involves persons who have experienced repeated bladder catheterization, including individuals with neural tube defects, such as myelomeningocele/meningocele or spina bifida; spinal cord trauma, urogenital malformations and neurogenic bladder, as well as individuals who have had multiple surgical procedures.

Occupational exposure involves individuals who have latex allergy from a work-related contact. Individuals who wear gloves at work or people who are repeatedly exposed to latex gloves via surgical procedures, dental procedures, examinations (especially vaginal exams for women and rectal exams for men), and those who frequently use latex products (ie latex nipples, pacifiers, diapers, catheters, or elastic in clothing) are at risk for developing latex allergy.

In the US alone, it is estimated that as many as one in every 10 health care workers is sensitive to natural rubber latex. As many as 10 percent are sensitized but show no signs or symptoms, and 2.5 percent are already experiencing symptoms. These estimates present a growing concern regarding the numbers of individuals experiencing latex problems:

- 5-15 percent of health care workers
- 9-13 percent of dental workers
- 11 percent of rubber workers
- 6.8 percent of atopic people
- 6.5 percent of people who have had multiple surgeries
- 18-73 percent of the spina bifida population.

Recommendations for babies born with congenital disorders indicate a need for latex precautions immediately after birth. To date there have been 23 deaths attributed to NRLA, many from reactions during barium enema examinations. Individuals at risk, especially those with co-existing atopy and/or multiple allergies, should provide a careful history that includes reactions to balloons or gloves, and medical products, such as catheters, used in chronic care.

## Types of latex allergy reactions

There are varying levels of latex allergic reactions, ranging from Type IV to the most severe Type I. These classifications are based on the symptoms presented and are determined by the individual's response to the latex contact.

### *Irritant dermatitis*

This condition is caused by a chemical irritation, such as residual soaps or rubbing of the skin under a glove. It is a localized skin reaction and doesn't involve the immune system.

### *Type IV dermatitis*

This condition involves a chemical- or allergic-contact dermatitis. It is caused by chemicals used in the production of latex and involves the immune system. The individual with a Type IV reaction will have urticaria. This type of latex allergy is not life threatening, but patients have been known to develop serious Type I symptoms (listed below).

### *Type I systemic reaction*

This condition (also known as Immediate Allergic Reaction) presents true allergic reactions caused by protein antibodies in the latex. An interaction between a foreign protein (antigen) and the body's defensive cells that produce antibodies (IgE antibodies) causes these allergies. Type I is the most serious allergic response and is potentially lethal. Serious anaphylactic reactions have occurred during surgeries, vaginal deliveries, dental procedures, and while donning gloves.

## Signs and symptoms of Type I latex allergy

### *Signs on the skin surface*

- Flushing of the skin, especially the face
- Hives
- Raised white "bumps" on hands that are noticeable when removing powdered gloves
- Contact rash (more than just a red rash) that disappears within minutes of removing gloves
- Seeping, thick, crusty open sores on hands
- Itching for no apparent reason

### *Signs involving nose, throat, airway, eyes*

- Sneezing
- Rhinitis
- Conjunctivitis
- Red, watery, itchy eyes
- Bronchospasm
- Wheezing
- Angioedema
- Shortness of breath
- Difficulty breathing
- Chest pain
- Cyanosis
- Faintness

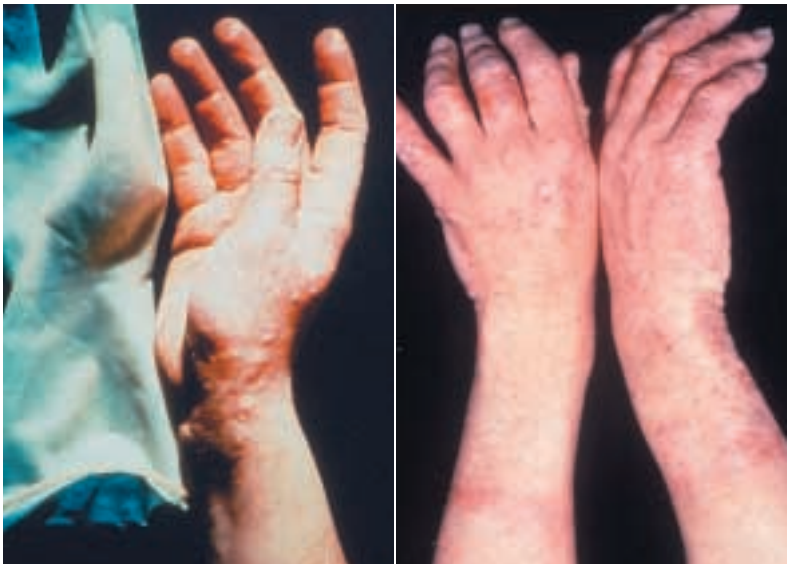

**FIGURE 1**

A pair of powdered gloves and hives, a typical Type I allergic reaction.

### *GI symptoms*

- Nausea
- Vomiting
- Abdominal cramping
- Diarrhea

### *Cardiovascular symptoms*

- Hypotension
- Sinus tachycardia
- Anaphylaxis (ranging from bronchospasm to full blown anaphylaxis)

## Diagnosis and recommendations

Individuals who suspect a latex allergy should see a physician immediately for an evaluation.

No medical tests are entirely accurate. The diagnosis is predicated on medical history and confirmed by an invitro blood test. Experts do not recommend routine diagnostic testing in the at-risk population. A variety of tests are available, including a skin-prick test, radioallergosorbent test (RAST), intradermal tests and a bronchial challenge.

The skin-prick test is less sensitive than an intradermal test, but more sensitive than a RAST. It involves dropping latex antigen in solution onto skin and piercing the skin gently with a needle through the solution. The latex-allergic patient will experience a wheal-and-flare reaction with a small risk of anaphylaxis.

The radioallergosorbent (RAST) test is an invitro test for the IgE antibody that is specifically applied to latex. However, it demonstrates only a variable sensitivity of 65-85 percent. This variability decreases its usefulness as a screening tool.

Intradermal testing for latex allergy is another alternative that is similar to skin-prick testing but instead the antigen is injected intradermally. More sensitive than SPT, the intradermal testing also has a bigger risk of systemic reaction because the antigen cannot be wiped from the skin.

The only successful treatment for latex allergy is avoidance, and exercising caution at work or

## Definitions

**Latex** is the water-based solution that contains particles of natural rubber from the rubber tree. People react to the proteins in this solution. Many gloves contain natural rubber but are referred to as non-latex when, in fact, they are available in latex form. These gloves, however, do not contain the proteins responsible for the allergy.

**Latex free** identifies products and equipment in which all latex has been removed or replaced. Becoming latex free is next to impossible when considering the common items that contain latex. A facility would have to replace keys on computers (rubber pads under the keys that serve as mufflers), eliminate rubber bands, prohibit tennis shoes with natural rubber soles, restrict underwear with latex bands, etc. Many products on the market today have no safe substitutes.

**Latex safe** refers to a situation where no latex gloves are used anywhere in the facility. Many of the latex-containing articles are being replaced with non-latex articles. No balloons are allowed in the facility. Going powder free does not make a facility latex safe. All furniture, drapes or window coverings, and all duct work needs to be cleaned to remove powder residue.

**Powder free** indicates a facility that has replaced all powdered gloves with powder-free gloves. However, it does not mean a latex allergic individual can enter, because many latex allergic individuals react to non-powdered latex gloves.

**Rubber** is a term used to describe natural rubber latex and synthetic rubber materials. "Natural rubber latex" is the key phrase in relation to latex allergy. Synthetic substitutes include polyisoprene, nitrile, neoprene and styrene-butadiene rubber (SBR). These materials, called elastomer or polymers, have elastic properties like natural rubber and many are in latex form. Because they contain no natural proteins, they do not produce latex allergy. Some people will have additional chemical allergies and cannot tolerate these products either. Many synthetic rubber products were developed during a shortage of natural rubber. Nitrile is used because of its resilience to fuels and oils. Most hoses are made from nitrile because of this resilience. Natural rubber is extremely degradable when exposed to fuel, oil and sunlight.

**Latex responsible** and **latex aware** are two terms used to assure patients that the facility is aware of latex allergies and enacting all possible measures to protect the patient and the employees.

home. Practical remedies include wearing low allergen, non-powdered gloves or non-latex gloves. However, non-powdered gloves may still contain up to 2 mg of powder, which acts as a carrier of latex proteins.

No latex products should be used by anyone in the proximity of an individual with latex allergy. Even a non-latex glove over a latex glove is not effective, in the event the non-latex glove fails. In addition to gloves, hats and masks may contain natural rubber latex. The most effective procedure is to provide non-latex supplies for the latex allergic individual.

In the case of patients, it is advisable to schedule the latex allergic person as the first case of the day and as early in the week as possible. There are reported cases of latex allergic patients reacting to proteins in the air even when the gloves are non-powdered.

Premade packs that contain latex gloves cannot be used with the latex allergic patient. It is not sufficient to merely remove the gloves because the proteins in the gloves have been dispersed throughout the whole pack. This precaution also applies to prep kits, catheter kits, back table packs, etc.

### Conclusion

Unfortunately, no remedy is available for latex allergy, and there is no guarantee that a facility is entirely safe for all latex allergic individuals. The best defense is knowledge about latex allergy. In 1997, the National Institute for Occupational Safety and Health (NIOSH) published an alert that listed specific recommendations to help workers protect themselves from latex exposure. In addition, the same report included detailed recommendations that employers should implement in the workplace.

The alert is available by calling 800-356-4674, by fax at 513-566-8573, or by e-mail at ***pubstaff@niosdtl.em.cdc.gov***. Ask for DHHS (NIOSH) Publication No. 97-135. Or visit the NIOSH home page at ***www.cdc.gov/niosh/homepage.html***.

Information is also available on the AST web site under Education, Standards of Practice, and on the opening page.

## Brief history of latex allergy

**1927** Urticaria and oral angioedema from dental prosthesis.

**1933** The first reported case of a Type IV reaction to rubber gloves was reported.

**1979** Report of contact Urticaria from rubber latex cleaning gloves in a housewife with a history of contact dermatitis.

**1980** Reports in European literature revealed Type I reactions to latex surgeon gloves in health care workers.

**1987** Center for Disease Control (CDC) implemented Universal Precautions for prevention of viral transmission in health care facilities.

**1988-1989** United States Food and Drug Administration (FDA) began receiving reports of allergic reactions to latex gloves, anaphylaxis (including deaths) intraoperatively and during barium enema tests, frequently in children with spina bifida.

**1989** First reports of latex allergy in the North American literature.

**1991** United States Food and Drug Administration (FDA) issued a warning that there was a potential hazard in the use of medical devices containing latex.

**1993** United States Food and Drug Administration (FDA) proposed regulations that would require all medical devices containing latex to prominently display that fact on their labels.

**1996** United States Food and Drug Administration (FDA) issues a proposed rule: Latex-Containing Devices: User Labeling.

**1997** National Institute for Occupational Safety and Health (NIOSH) releases an alert "Preventing Allergic Reactions to Natural Rubber Latex in the Workplace" in June 1997.

**1997** United States Food and Drug Administration (FDA) issued a final rule requiring labeling of medical devices that contain natural rubber latex, including device packaging, and medical devices that contain dry natural rubber. Also the wording of 'hypoallergenicity' be removed from the labeling medical devices that contain natural rubber.

## About the author

Pat Lawson, CST, is the Iowa affiliate of ELASTIC, a nonprofit organization dedicated to the education of Natural Rubber Latex Allergy. Lawson utilizes her personal experience with Type I and Type IV latex allergies to present educational sessions around the country. She also consults with product manufacturers and assists facilities in establishing latex-safe protocols. Lawson serves on the AST Board of Directors and will be presenting a workshop on latex allergy at the AST 32nd Annual Conference in Atlanta, Georgia, May 16-19, 2001.

**FIGURE 2**

The technique of tapping a rubber tree.

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