American Latex Allergy Association

NIOSH ALERT Booklet

Preventing Allergic Reactions to Natural Rubber Latex in the Workplace

WARNING!
Workers exposed to latex gloves and other products containing natural rubber latex may develop allergic reactions such as skin rashes; hives; nasal, eye, or sinus symptoms; asthma; and (rarely) shock.

The National Institute for Occupational Safety and Health (NIOSH) requests assistance in preventing allergic reactions to natural rubber latex* among workers who use gloves and other products containing latex. Latex gloves have proved effective in preventing transmission of many infectious diseases to health care workers. But for some workers, exposures to latex may result in skin rashes; hives; flushing; itching; nasal, eye, or sinus symptoms; asthma; and (rarely) shock. Reports of such allergic reactions to latex have increased in recent years ?especially among health care workers.

At present, scientific data are incomplete regarding the natural history of latex allergy. Also, improvements are needed in methods used to measure proteins causing latex allergy. This Alert presents the existing data and describes six case reports of workers who developed latex allergy. The document also presents NIOSH recommendations for minimizing latex-related health problems in workers while protecting them from infectious materials. These recommendations include reducing exposures, using appropriate work practices, training and educating workers, monitoring symptoms, and substituting nonlatex products when appropriate.

NIOSH requests that employers, owners, editors of trade journals, safety and health officials, and labor unions bring the recom- mendations in this Alert to the attention of all workers who may be exposed to latex.

*In this document, the term ?latex? refers to natural rubber latex and includes products made from dry natural rubber. Natural rubber latex is the product manufactured from a milky fluid derived mainly from the rubber tree, Hevea brasiliensis

Background

Composition of Latex
Latex products are manufactured from a milky fluid derived from the rubber tree, Hevea brasiliensis. Several chemicals are added to this fluid during the processing and manufacture of commercial latex. Some proteins in latex can cause a range of mild to severe allergic reactions. Currently available methods of measurement do not

provide easy or consistent identification of allergy-causing proteins (antigens) and their concentrations. Until well accepted standardized tests are available, total protein serves as a useful indicator of the exposure of concern. [Beezhold et al. 1996a]. The chemicals added during processing may also cause skin rashes. Several types of synthetic rubber are also referred to as ?latex,? but these do not release the proteins that cause allergic reactions.

Products Containing Latex

A wide variety of products contain latex: medical supplies, personal protective equipment, and numerous household objects. Most people who encounter latex products only through their general use in society have no health problems from the use of these products. Workers who repeatedly use latex products are the focus of this Alert. The following are examples of products that may contain latex:

Emergency Equipment

Blood pressure cuffs
Stethoscopes
Disposable gloves
Oral and nasal airways
Endotracheal tubes
Tourniquets
Intravenous tubing
Syringes
Electrode pads

Personal Protective Equipment

Gloves
Surgical masks
Goggles
Respirators
Rubber aprons

Office Supplies

Rubber bands
Erasers

Hospital Supplies

Anesthesia masks
Catheters
Wound drains
Injection ports
Rubber tops of multidose vials
Dental dams

Household Objects

Automobile tires
Motorcycle and bicycle handgrips
Carpeting
Swimming goggles
Racquet handles
Shoe soles
Expandable fabric (waistbands)
Dishwashing gloves
Hot water bottles
Condoms
Diaphragms
Balloons
Pacifiers
Baby bottle nipples

Individuals who already have latex allergy should be aware of latex-containing products that may trigger an allergic reaction. Some of the listed products are available in latex-free forms.

Latex in the Workplace

Workers in the health care industry (physicians, nurses, dentists, technicians, etc.) are at risk for developing latex allergy because they use latex gloves frequently. Also at risk are workers with less frequent glove use (hairdressers, housekeepers, food service workers, etc.) and workers in industries that manufacture latex products.

Types Of Reactions to Latex

Three types of reactions can occur in persons using latex products:

- Irritant contact dermatitis
- Allergic contact dermatitis (delayed hypersensitivity)
- Latex allergy

Irritant Contact Dermatitis
The most common reaction to latex products is irritant contact dermatitis ? the development of dry, itchy, irritated areas on the skin, usually the hands. This reaction is caused by skin irritation from using gloves and possibly by exposure to other workplace products and chemicals. The reaction can also result from repeated hand washing and drying, incomplete hand drying, use of cleaners and sanitizers, and exposure to powders added to the gloves. Irritant contact dermatitis is not a true allergy.

Chemical Sensitivity Dermatitis
Allergic contact dermatitis (delayed hypersensitivity, also sometimes called chemcial sensitivity dermatitis) results from exposure to chemicals added to latex during harvesting, processing, or manufacturing. These chemicals can cause skin reactions similar to those caused by poison ivy. As with poison ivy, the rash usually begins 24 to 48 hours after contact and may progress to oozing skin blisters or spread away from the area of skin touched by the latex.

Latex Allergy
Latex allergy (immediate hypersensitivity) can be a more serious reaction to latex than irritant contact dermatitis or allergic contact dermatitis. Certain proteins in latex may cause sensitization (positive blood or skin test, with or without symptoms). Although the amount of exposure needed to cause sensitization or symptoms is not known, exposures at even very low levels can trigger allergic reactions in some sensitized individuals.

Reactions usually begin within minutes of exposure to latex, but they can occur hours later and can produce various symptoms. Mild reactions to latex involve skin redness, hives, or itching. More severe reactions may involve respiratory symptoms such as runny nose, sneezing, itchy eyes, scratchy throat, and asthma (difficult breathing, coughing spells, and wheezing). Rarely, shock may occur; but a life-threatening reaction is seldom the first sign of latex allergy. Such reactions are similar to those seen in some allergic persons after a bee sting.

Levels and Routes of Exposure

Studies of other allergy-causing substances provide evidence that the higher the overall exposure in a population, the greater the likelihood that more individuals will become sensitized [Venables and Chan-Yeung 1997]. The amount of latex exposure needed to produce sensitization or an allergic reaction is unknown; however, reductions in exposure to latex proteins have been reported to be associated with decreased sensitization and symptoms [Tarlo et al. 1994; Hunt et al. 1996].

Figure 1. Dust produced by removing a latex glove containing powder.

The proteins responsible for latex allergies have been shown to fasten to powder that is used on some latex gloves. When powdered gloves are worn, more latex protein reaches the skin. Also, when gloves are changed, latex protein/powder particles get into the air, where they can be inhaled and contact body membranes (see Figure 1) [Heilman et al. 1996]. In contrast, work areas where only powder-free gloves are used show low levels

or undetectable amounts of the allergy-causing proteins [Tarlo 1994; Swanson et al. 1994].

Wearing latex gloves during episodes of hand dermatitis may increase skin exposure and the risk of developing latex allergy. The risk of progression from skin rash to more serious reactions is unknown. However, a skin rash may be the first sign that a worker has become allergic to latex and that more serious reactions could occur with continuing exposure [Kelly et al. 1996].

Who is at Risk?

Workers with ongoing latex exposure are at risk for developing latex allergy. Such workers include health care workers (physicians, nurses, aides, dentists, dental hygienists, operating room employees, laboratory technicians, and hospital housekeeping personnel) who frequently use latex gloves and other latex-containing medical supplies. Workers who use latex gloves less frequently (law enforcement personnel, ambulance attendants, funeral-home workers, fire fighters, painters, gardeners, food service workers, and housekeeping personnel) may also develop latex allergy. Workers in factories where latex products are manufactured or used can also be affected.

Atopic individuals (persons with a tendency to have multiple allergic conditions) are at increased risk for developing latex allergy. Latex allergy is also associated with allergies to certain foods especially avocado, potato, banana, tomato, chestnuts, kiwi fruit, and papaya. [Blanco et al. 1994; Beezhold et al. 1996b]. People with spina bifida are also at increased risk for latex allergy.

Diagnosing Latex Allergy

Latex allergy should be suspected in anyone who develops certain symptoms after latex exposure, including nasal, eye, or sinus irritation; hives; shortness of breath; coughing; wheezing; or unexplained shock. Any exposed worker who experiences these symptoms should be evaluated by a physician, since further exposure could result in a serious allergic reaction. A diagnosis is made by using the results of a medical history, physical examination, and tests.

Taking a complete medical history is the first step in diagnosing latex allergy. In addition, blood tests approved by the Food and Drug Administration (FDA) are available to detect latex antibodies. Other diagnostic tools include a standardized glove-use test or skin tests that involve scratching or pricking the skin through a drop of liquid containing latex proteins. A positive reaction is shown by itching, swelling or redness at the test site. However, no FDA-approved materials are yet available to use in skin testing for latex allergy. Skin testing and glove-use tests should be performed only at medical centers with staff who are experienced and equipped to handle severe reactions.

Testing is also available to diagnose allergic contact dermatitis. In this FDA-approved test, a special patch containing latex additives is applied to the skin and checked over several days. A positive reaction is shown by itching, redness, swelling, or blistering where the patch covered the skin.

Occasionally, tests may fail to confirm a worker who has a true allergy to latex, or tests may suggest latex allergy in a worker with no clinical symptoms. Therefore, test results must be evaluated by a knowledgeable physician.

Treating Latex Allergy

Once a worker becomes allergic to latex, special precautions are needed to prevent exposuresduring work as well as during medical or dental care. Certain medications may reduce the allergy symptoms, but complete latex avoidance (though quite difficult) is the most effective approach. Many facilities maintain latex-safe areas for affected patients and workers.

How Common is Latex Allergy?

The prevalence of latex allergy has been studied by several methods:

- Questionnaires to assess reactions to latex gloves
- Medical histories of reactions to latex-containing products
- Skin tests
- Tests for latex antibodies in a worker?s blood

Reports about the prevalence of latex allergy vary greatly. This variation is probably due to different levels of exposure and methods for estimating latex sensitization or allergy. Recent reports in the scientific literature indicate that from about 1% to 6% of the general population and about 8% to 12% of regularly exposed health care workers are sensitized to latex [Kelly et al. 1996; Katelaris et al. 1996; Liss et al. 1997; Ownby et al. 1996; Sussman and Beezhold 1995]. Among sensitized workers, a variable proportion have symptoms or signs of latex allergy. For example, one study of exposed hospital workers found that 54% of those sensitized had latex asthma, with an overall prevalence of latex asthma of 2.5% [Vandenplas et al. 1995]. Prevalence rates up to 11% are reported for non-health care workers exposed to latex at work [van der Walle and Brunsveld 1995; Nasuruddin et al. 1993; Orfan et al. 1994; Tarlo et al. 1990].

Several reasons may exist for the large numbers of latex allergies recently reported in workers [Truscott 1995]:

1. Workers rely increasingly on latex gloves to prevent the transmission of human immunodeficiency virus (HIV), hepatitis B virus, and other infectious agentsas outlined in Recommendations for Prevention of HIV Transmission in Health-Care Settings [CDC 1987] and in Guidelines for Prevention of Transmission of Human Immunodeficiency Virus and Hepatitis B Virus to Health-Care and Public-Safety Workers [CDC 1989].

2. Since 1992, the Occupational Safety and Health Administration (OSHA) has required employers to provide gloves and other protective measures for their employees [29 CFR*1910.1030, Bloodborne pathogens]. **Code of Federal Regulations. See CFR in references.*

3. Some manufacturers may have produced more allergenic gloves because of changes in raw materials, processing, or manufacturing procedures to meet the increased demand for latex gloves [Hunt et al. 1995]. These production changes may account partly for the varied concentrations of extractable latex proteins reported for latex gloves (up to a 3,000-fold difference in gloves from various manufacturers) [Yunginger et al. 1994; Beezhold 1992]. Variations may also exist between lots produced by the same manufacturer.

4. Physicians are more familiar with latex allergy and have improved methods for diagnosing it.

Case Reports

The following case reports briefly describe the experiences of six workers who developed latex allergy after

occupational exposures. These cases are not representative of all reactions to latex but are examples of the most serious types of reactions. They illustrate what has occurred in some individuals.

Case No. 1
A laboratory technician developed asthma symptoms after wearing latex gloves while performing blood tests. Initially, the symptoms occurred only on contact with the gloves; but later, symptoms occurred when the technician was exposed only to latex particles in the air [Seaton et al. 1988].

Case No. 2
A 33-year-old woman sought medical treatment for occupational asthma after 6 months of periodic cough, shortness of breath, chest tightness, and occasional wheezing. She had worked for 7 years as an inspector at a medical supply company, where her job included inflating latex gloves coated with cornstarch. Her symptoms began within 10 minutes of starting work and worsened later in the day (90 minutes after leaving work). Symptoms disappeared completely while she was on a 12-day vacation, but they returned on her first day back at work [Tarlo et al. 1990].

Case No. 3
A nurse developed hives in 1987, nasal congestion in 1989, and asthma in 1992. Eventually she developed severe respiratory symptoms in the health care environment even when she had no direct contact with latex. The nurse was forced to leave her occupation because of these health effects [Bauer et al. 1993].

Case No. 4
A midwife initially suffered hives, nasal congestion, and conjunctivitis. Within a year, she developed asthma, and 2 years later she went into shock after a routine gynecological examination during which latex gloves were used. The midwife also suffered respiratory distress in latex-containing environments when she had no direct contact with latex products. She was unable to continue working [Bauer et al. 1993].

Case No. 5
A physician with a history of seasonal allergies, runny nose, and eczema on his hands suffered severe runny nose, shortness of breath, and collapse minutes after putting on a pair of latex gloves. He was successfully resuscitated by a cardiac arrest team [Rosen et al. 1993].

Case No. 6
An intensive care nurse with a history of runny nose, itchy eyes, asthma, eczema, and contact dermatitis experienced four severe allergic reactions to latex. The first reaction began with asthma severe enough to require treatment in an emergency room. The second and third reactions were similar to the first. The fourth and most severe reaction occurred when she put on latex gloves at work. She went into severe shock and was successfully treated in an emergency room [Rosen et al. 1993].

Conclusions

Latex allergy in the workplace can result in potentially serious health problems for workers, who are often unaware of the risk of latex exposure. Such health problems can be minimized or prevented by following the recommendations outlined in this Alert.

Recommendactions

The following recommendations for preventing latex allergy in the workplace are based on current knowledge and a common-sense approach to minimizing latex-related health problems. Evolving manufacturing technology and improvements in measurement methods may lead to changes in these recommendations in the future. For now, adoption of the recommendations wherever feasible will contribute to the reduction of exposure and risk for the development of latex allergy. **Employers**
Latex allergy can be prevented only if employers adopt policies to protect workers from undue latex exposures. NIOSH recommends that employers take the following steps to protect workers from latex exposure and allergy in the workplace:

1. Provide workers with nonlatex gloves to use when there is little potential for contact with infectious materials (for example, in the food service industry).

2. Appropriate barrier protection is necessary when handling infectious materials [CDC 1987]. If latex gloves are chosen, provide reduced protein, powder-free gloves to protect workers from infectious materials. *The goal of this recommendation is to reduce exposure to allergy-causing proteins (antigens). Until well accepted standardized tests are available, total protein serves as a useful indicator of the exposure of concern.*

3. Ensure that workers use good housekeeping practices to remove latex-containing dust from the workplace:

   »Identify areas contaminated with latex dust for frequent cleaning (upholstery, carpets, ventilation ducts, and plenums).

   »Make sure that workers change ventilation filters and vacuum bags frequently in latex-contaminated areas.
4. Provide workers with education programs and training materials about latex allergy.

5. Periodically screen high-risk workers for latex allergy symptoms. Detecting symptoms early and removing symptomatic workers from latex exposure are essential for preventing long-term health effects.

6. Evaluate current prevention strategies whenever a worker is diagnosed with latex allergy.

Workers
Workers should take the following steps to protect themselves from latex exposure and allergy in the workplace:

1. Use nonlatex gloves for activities that are not likely to involve contact with infectious materials (food preparation, routine housekeeping, maintenance, etc.).

2. Appropriate barrier protection is necessary when handling infectious materials [CDC 1987]. If you choose latex gloves, use powder-free gloves with reduced protein content:

   »Such gloves reduce exposures to latex protein and thus reduce the risk of latex allergy (though symptoms may still occur in some workers).

   »So-called hypoallergenic latex gloves do not reduce the risk of latex allergy. However, they may reduce reactions to chemical additives in the latex (allergic contact dermatitis).

3. Use appropriate work practices to reduce the chance of reactions to latex:

   »When wearing latex gloves, do not use oil-based hand creams or lotions (which can cause glove deterioration) unless they have been shown to reduce latex-related problems and maintain glove barrier protection.

   »After removing latex gloves, wash hands with a mild soap and dry thoroughly.

   »Use good housekeeping practices to remove latex-containing dust from the workplace:
   - Frequently clean areas contaminated with latex dust (upholstery, carpets, ventilation ducts, and plenums).
   - Frequently change ventilation filters and vacuum bags used in latex-contaminated areas.

4. Take advantage of all latex allergy education and training provided by your employer:

   »Become familiar with procedures for preventing latex allergy.
   »Learn to recognize the symptoms of latex allergy: skin rashes; hives; flushing; itching; nasal, eye, or sinus symptoms; asthma; and shock.

5. If you develop symptoms of latex allergy, avoid direct contact with latex gloves and other latex-containing products until you can see a physician experienced in treating latex allergy.

6. If you have latex allergy, consult your physician regarding the following precautions: »Avoid contact with latex gloves and other latex-containing products.

   »Avoid areas where you might inhale the powder from latex gloves worn by other workers.

   »Tell your employer and your health care providers (physicians, nurses, dentists, etc.) that you have latex allergy.

   »Wear a medical alert bracelet.

7. Carefully follow your physician?s instructions for dealing with allergic reactions to latex.

Additional Information

For additional information about latex allergy, call 1-800-35-NIOSH (1-800-356-4674); or visit the NIOSH Home Page on the World Wide Web at **http://www.cdc.gov/niosh/** [1]

You may access the following latex allergy website directly or by selecting Latex Allergy through the NIOSH Home Page:
http://www.familyvillage.wisc.edu/lib_latx.htm [2]

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We greatly appreciate your assistance in protecting the health of U.S. workers.

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