

fessions are unaware of the issues with latex sensitivity. But many students who required extensive medical treatment as young children, and therefore are more susceptible to latex allergy, are now entering public schools.

The first incidents of latex allergy in the United States were reported in 1988. Numbers had increased to at least 500,000 by 1992. Published estimates, based on medical testing, indicate 17 million adults in the general U.S. population are affected by Type 1 latex allergy, the most severe category (Cornish and Siler, 1996).

Between 1990 and January 1991, nine children at a children's hospital in Milwaukee had anaphylactic reactions within 30 minutes after general anesthesia was started, but before any surgical incisions had been made. The latex connection was the anesthesia equipment and intravenous catheters. Eight of the children required intensive care. (Stehlin, 1992; Anonymous, 1996-A; Jancin, 1992; Sussman and Beezhold, 1995; American Academy of Allergy and Immunology, 1993).

Preliminary reports of a nationwide survey of children's hospitals have identified at least 25 other institutions that have reported similar reactions since January 1990. All 75 children

who had anaphylactic reactions had either spina bifida or other conditions involving the genitourinary tract (Anonymous, 1996-A; Jancin, 1992; Meeropol, Leger, and Frost, 1993; Shapiro, Kelly, Setlock, Suwalski, and Meyers, 1992; Young, Meyers, McCulloch, and Brown, 1992).

What is Latex?

Latex runs in special ducts, which are in a layer immediately outside the *cambium* layer in the *Hevea brasiliensis* tree. Sap runs deep inside of the tree, beneath the cambium layer. To tap the tree, a skilled tapper shaves the thinnest possible layer from the intact section of bark. Once the latex starts flowing, the tapper leaves a small cup underneath the cut. Latex will coagulate into a lump in the bottom of the cup (cup lump).

If latex is needed, the tapper adds a stabilizing agent, usually ammonia, which prevents the latex from coagulating. The raw liquid is poured into containers and delivered to a processing station where it is strained and concentrated. At no stage is the latex heated. This means the proteins remain in the latex.

If solid rubber is required, the cup lump, together with bits and pieces of

latex on the bark and ground, are collected together and processed. This processing involves heat, which destroys many (but not all) of the proteins and produces solid rubber.

Increase in Allergies

Why has allergy to latex increased so dramatically in the past dozen years? In 1987, there was a movement throughout the world to take precautions that would prevent the spread of infectious diseases, especially human immunodeficiency virus (HIV). This effort resulted in the application of universal precautions for protecting a person from infectious material using protective barriers. Latex is the barrier of choice to protect against HIV and Hepatitis B.

New and inexperienced glove manufacturers entered the market and short-cuts in manufacturing became common in order to supply the increased demand (Bodycoat, 1993). Altered manufacturing processes included reduction and sometimes elimination of the leaching step normally used to wash the latex products (Bodycoat, 1993; Russell-Fell, 1993). This washing process removes soluble latex compounds as well as chemical additives. Underwashed products contain high levels of *Hevea brasiliensis* latex proteins, which cause allergic reactions in some people.

In May 1991, the FDA outlined a letter to all manufacturers of latex medical devices to use a two-step

Resources for Latex Allergies

Allergy to Latex Education and Resource Team (ALERT); (888) 972-5378; <http://www.execpc.com/~alert/>

Education for Latex Allergy/Support Team and Information Coalition (ELASTIC); (610) 436-4801; <http://pweb.netcom.com/~ecbdmd/elastic.html> (contact ELASTIC for the telephone number of a support team contact in your state)

Latex Allergy Help; (905) 885-5270; <http://www.latexallergyhelp.com>

National Information Center for Children and Youth with Disabilities (NICHCY); (800) 695-0285

National Institute for Occupational Safety and Health (NIOSH). (800) 356-4674; 4676 Columbia Parkway, Cincinnati, OH 45226-1998; <http://www.cdc.gov/niosh/latexalt.html>

National Paint and Coatings Association; (202) 462-6272; Public Affairs Division, 1500 Rhode Island Ave., NW, Washington, DC 20005

Type 4 allergic reactions include dry, itchy, red, irritated areas on the skin, itching/burning/irritated eyes, runny nose, wheezing, or blisters on the hands.

washing procedure—first during the production leaching process and again after the product is completed—to remove many of latex's allergenic proteins. In June 1997, the National Institute for Occupational Safety and Health (NIOSH) released a NIOSH Alert "warning sheet" for workers exposed to latex and other products containing natural rubber latex. The document lists products containing latex, recommendations for preventing latex allergies in the workplace, and references on latex allergies (NIOSH, 1997; Bubak, 1992; Jancin, 1992). In the past decade, the FDA received in excess of 1,700 reports of severe allergic reactions, including 16 deaths in children related to medical devices containing latex (Anonymous, 1998).

Why Latex?

Why not use only synthetic alternatives? Synthetic alternatives to *Hevea brasiliensis* latex products do not have the required range of physical properties that encompass resilience, strength, elasticity, and viral impermeability. Latex maintains its barrier longer than vinyl and can be stretched so thin that it doesn't interfere with the sensitivity and fine manual dexterity required in many medical procedures (Stehlin, 1992; Jancin, 1992; Meeropol, Leger, and Frost, 1993; Shapiro, Kelly, Setlock, Suwalski, and Meyers, 1992).

Latex-free synthetic rubber, such as neoprene, nitrile, SBR, Butyl, and Vitron are polymers that are available as alternates to natural rubber. There are no naturally occurring proteins in them, and they are NOT responsible for latex allergy (Cornish and Siler, 1996).

What Is Latex Allergy?

There are 57 allergenic proteins in tropical rubber. There are several types of allergic reactions to latex differentiated by the severity of the response.

Type 4 reactions are limited to the

Allergy Treatment

There is no cure for a latex allergy. People in a high-risk group can prevent the development of latex allergy by avoiding latex products in all areas of their lives. If a person in a high-risk group has already developed latex allergy, avoidance may lessen the degree of disease he or she develops. In order to protect themselves, **students** with latex allergies should

- carry nonlatex gloves at all times for health care professionals to use during both routine examinations and emergency procedures. School nurses should have a supply of nonlatex gloves available for use.
- wear a Medic Alert bracelet.
- carry an emergency epinephrine kit (epi-pen) in case they are accidentally exposed to latex and go into anaphylactic shock. Because of liability issues, many states do not allow teachers to administer epi-pens to students; however, teachers are allowed to hold the epi-pen next to the skin for the child to push in the syringe. Check your individual state law to know what is expected/your responsibility.
- alert their health care providers of their sensitivity. The school nurse, playground aides, and classroom teacher should be aware of what to do in case of an allergic reaction. The physical education instructor should also be familiar with the student's allergy since sporting equipment is oftentimes made from rubber-based products. Cafeteria workers may need to adjust their food preparation practices to address the student's sensitivity.
- carry on their person a written set of procedures to follow. This is particularly important for classroom teachers since all schools do not have a nurse available in the building every day, all day. Also, substitute teachers should be informed of the student's needs. Minutes matter, so this is an imperative safety step (NICHCY, telephone conversation with author; NIOSH, 1997; Ozment, 1997).

exposed area and are identified as contact dermatitis or as allergic contact dermatitis. Symptoms include the development of dry, itchy, red, irritated areas on the skin, usually the hands. Allergic contact 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. Other Type 4 reactions include itching/burning/irritated eyes, runny nose, wheezing, or blisters on the hands. The blisters may spread away from the area of skin touched by the latex. Symptoms may occur anywhere from 24 to 48 hours after exposure. Because reactions vary, there is no standard time frame for when symptoms start to go away.

A Type 1 hypersensitive reaction represents a broad spectrum of symptoms and is identified as a systemic

reaction. Although the amount of exposure needed to cause sensitization or symptoms is not known, exposure even at low levels can trigger allergic reactions in sensitive individuals.

Reactions usually begin within minutes of exposure to latex, but they can occur hours later and can produce various symptoms. Very mild symptoms include skin redness, hives, or itching. More severe reactions may include respiratory symptoms such as a runny nose and watery eyes, sneezing, itchy eyes, scratchy throat, and asthma.

Very severe cases can include an anaphylactic episode, a response the body has to a mass allergen exposure. In this case, skin rash, itching, hives, swollen red skin, tears, itching or burning eyes, swollen lips and tongue with difficulty breathing or wheezing, asthma, shortness of breath, dizziness,

Table 1. Products that Contain Latex and Their Alternatives.

This list is a compilation of several information resources. By no means is this a complete list—this is a **partial sample** of products. Products change frequently—please contact manufacturers to make sure these substitutes still do not contain latex.

Frequently Contain Latex	Alternative Product or Method	Frequently Contain Latex	Alternative Product or Method
Automobile floor mats, steering wheel	Vinyl, clear, or leather cover; cover with a cover	Items in first-aid kits	Synthetic, vinyl gloves
Art supplies: paint, markers, glue, erasers	Elmers (School Glue, Glue All, Glue Colors, Sno-Drift paste); Faber-Castel art erasers; Crayola products (except rubber stamps and erasers); Liquitex paints; provide a barrier between self and product	Fish tanks and decorations in tank (seals in tank are frequently latex)	—
Balloons	Mylar balloons	Floor coverings: carpet backings, mats, rubber gym floors	Nonskid rug pad, wooden floors, provide barrier cloth
Balls: koosh, tennis, rubber, basketball, bowling ball (usually house balls are 100 percent rubber)	Vinyl, Thorton sports balls, PVC-Hedstrom sports ball	Foam rubber (art projects, packaging material in boxes)	Synthetic foam
Bandages	Active and Comfort Strips by 3M	Food handling gloves	Synthetic, vinyl; <i>Note: inquire at school cafeteria, grocery store, and restaurants before eating</i>
Bath mat (used as a reading mat in the classroom and in front of the classroom sink)	Bathroom throw rugs with nonskid backing; 100 percent cotton reversible rug	Food storage bags/zippered plastic bags	Ziploc Dow brands, wax paper, plain plastic bags, Handiwrap, Saran Wrap
Braces or splints with foam lining	Line with cloth or felt	Garden hoses	Vinyl hoses
Bed protector (washable rubber pad)	Disposable underpads	Gaskets	Neoprene, Silicone
Casts: Delta-lite Comfortable	Scotchcast soft cast, fiberglass, fabric	Gloves: housekeeping, rubber, kitchen	Vinyl Allerderm, Nyplex by Magla, Solvex nitril by Ansell, use cotton liners
Camera eyepiece, binocular eyepiece	—	Glue: envelopes, stamps	Use a wet cloth to moisten
Chewing gum	Bubblicious; Trident; Dentyne; Mint-a-Burst, Cinn-a-Burst, Fruit-a-Burst by Warner-Lambert; Wrigley's Gums	Helmets: bike, in-line skating, motorcycle	—
Cosmetics: applicators, sponges, eyelash curler, waterproof mascara; <i>cosmetics may contain papain, a papaya derivative that can cross-react with latex</i>	Clinique, Luminescence, Qosmedix Alternative Resource Catalog, cotton balls or brushes	Hot-water bottles	—
Crutches: axillary and hand pads	Cover with stockinet, cloth, or tape	Lottery ticket (instant winner scratch-off is latex)	—
Drain stoppers	—	Mouse pad	MediaMate, FastTrac mouse pad model #15640, Expressions #6292 by Rubbermaid, Keytronics, Reason Technology
Driveway sealant	—	Pantyhose	Lykra-Spandex, L'Eggs, tuck clothes under waistband
Earphones, headsets	—	Pens with rubber grippers	Plastic pens
Electrical appliance cords	—	Plants: poinsettia, ficus, rubber plants	—
Elastic: underwear, clothing	Cover with cloth, Decent Exposures Alternative Resources Catalog, Seventh Generation	Raincoats, waterproof boots	Neoprene-coated nylon
Erasers	—	Rubber bands	Plastic bands by Baumgarten, string, spring clips
Feminine sanitary pads and tampons	New Freedom by Kimberly Clark, Naturals by Tampax, NatraCare	Rubber button pads: telephones, calculators, television remote control, computer keyboard covers	Most are silicone rubber—check with manufacturer

Table 1. Products that Contain Latex and Their Alternatives. (Continued)

Frequently Contain Latex	Alternative Product or Method	Frequently Contain Latex	Alternative Product or Method
Shoes: rubber boots, crepe sole, arch pads, rubber thongs, water shoes	Rubber-free sport shoe by PW Minor Shoe Company, PVC waterproof boots, Superfeet	Telephone receiver/headset/shoulder rest	—
Silk flowers (latex-covered stem)	—	Tires: rubber	—
Silly Putty	—	Tools with rubber handles	Vinyl or leather handles; cover with tape
Socks	Cotton socks without elastic; Vermont Country Store, Buster Brown, Kathy Ireland cotton/lycra nylon at Kmart	Toothbrush handles with rubber grips	Oral B, Reach soft bristle by Crest; <i>Note: most handles are synthetic</i>
Spatulas	Wooden, plastic, synthetic	Toys—it is best to check with the manufacturer	Mattel (800) 421-2287 Fisher Price (800) 432-5437 Shelcore (800) 777-0453 Little Tykes (800) 321-0183 Grace (800) 345-4109 Ohio Art (800) 800-3141 Parker Brothers (800) 344-4050 Milton Bradley (800) 525-6411 Power Wheels (800) 348-8751 Tyco Industries (800) 367-8926 Discovery Toys (800) 426-4777 Hasbro/Playskool (800) 752-9755 Safety First (800) 962-7233 Lego (800) 422-5346
Sports equipment: water toys, swim cap, thongs, goggles; handles on ping-pong paddles, golf clubs, aluminum baseball bats, tennis/squash rackets, ski poles; canoe, kayak, sailing, and rafting equipment	PVC or plastic water toys; silicone or vinyl swim caps, thongs, goggles; WINNinc. sells polyurethane replacement grips for sports equipment; vinyl or leather grips; Planetary Gear has alternate canoe, kayak, and rafting gear	Watch band	Leather, metal, or cloth
Some stretch fabrics	Lycra-spandex by Dupont	Weather stripping	—
Swimsuits	—	Wheelchair cushions, tires	—
T-shirts with appliques	—		
Tape: adhesive, clear, masking	—		

fainting, abdominal pain, nausea, and diarrhea can occur and be life threatening.

In rare cases, an allergic individual goes into shock. Blood pressure plummets, the throat swells, and the airways in the lungs constrict. This kind of reaction can be the result of inhaling latex particles that are in the air or introducing latex through direct contact with rubber products. Without immediate treatment, the person will die. A shot of epinephrine—the same drug used to treat severe allergic reactions to bee stings—will counteract the shock if given immediately (Slater, 1989; Sussman and Beezhold, 1995; American Academy of Allergy and Immunology, 1993).

Determining Latex Sensitivity

Certain fruits, vegetables, nuts, and cereals contain proteins that are simi-

lar to the proteins found in latex. In essence, what can happen is that our bodies can generalize an allergic reaction from one protein to another similar one. This is called *cross-reactivity*. For some, having a known allergy to one or more of these foods may serve as an early warning sign of possible latex allergy, but it is not guaranteed. The reverse is also true: Just because you don't have other allergies does not mean you will not develop a latex allergy.

The following foods cross-react with latex: avocados, bananas, pineapples, apricots, grapes, kiwis, tomatoes, papayas, passion fruit, cherries, figs, peaches, nectarines, plums, celery, raw potatoes, hazelnuts, and chestnuts. Bananas have the highest cross-reactivity correlation to latex allergies (Ozment, 1997; National Information Center for Children and Youth with Disabilities (NICHCY), telephone conversation with author).

Identifying a sensitivity to latex is determined from a review of past medical history, a physical exam, and blood tests. Three FDA-approved blood tests for latex-specific IgE antibodies are now used. Test results define the presence of sensitivity. Once a sensitivity is present, IgE antibodies cannot be used to predict how severe a reaction will occur.

A latex allergy, like all allergies, occurs with exposure to the allergen. This progressive allergy worsens with increased exposure to latex (Sussman and Beezhold, 1995; American Academy of Allergy and Immunology, 1993).

Who Is at Risk?

Recent reports in scientific literature indicate that 2–8 percent of the general population and 8–17 percent of regularly exposed health care workers (continued on page 52)

(Looking Out for Latex,
continued from page 25)

are sensitized to latex. Because of constant exposure to latex, two groups are at greater risk—health care workers and children with spina bifida and other conditions that involve multiple surgical procedures (Ozment, 1997; Meeropol, Leger, and Frost, 1993; Shapiro, Kelly, Setlock, Suwalski, and Meyers, 1992; Young, Meyers, McCulloch, and Brown, 1992).

Patients, especially special needs children who have multiple repeated exposures to latex, usually through mucosal exposure, are at a higher risk for developing latex allergy. The Spina Bifida Association of America and the FDA estimate that as many as 65 percent of children with spina bifida have latex allergy. Lesser incidences, but still above 25 percent, occur in all patients (any age) with spinal injuries (up to 25 percent) and children with multiple congenital defects (33 percent), especially urinary tract defects, and any child who has had three or more surgeries (children with spina bifida have surgeries very early in life) (3 percent). It is the repeated exposure to latex (usually through catheterization) that sensitizes people to latex (Ozment, 1997; Sussman and Beezhold, 1995; American Academy of Allergy and Immunology, 1993).

Latex-Safe Products

Latex products can be identified by looking for the letters *NRL*, which stand for Natural Rubber Latex or the words *rubber* or *latex*. Latex is used in thousands of home/school products. It is in underwear, clothing, socks and shoes, underneath the carpet, and in the rubber plant in the school greenhouse. It is in rain slickers and in the pacifiers and baby-bottle nipples for children in preschool programs.

Contact may come from unexpected sources, such as fast food workers preparing an order. The list of ex-

Resources

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amples is endless (see Table 1 on pages 24 and 25). The accuracy of this list cannot be relied upon 100 percent because manufacturers change their products frequently. If you are in doubt, check by calling the manufacturer to verify absence of latex (Ozment, 1997; NICHCY, telephone conversation with author).

I have identified products in the professional setting that impacted my student with a latex allergy. Not only did I need to redesign many activities and projects for her, but the entire school setting had to be evaluated for latex products.

Everything from the welcome mat at the entrance to the school to the gaskets that fixed the leaky school faucets caused reactions. When the school driveway was being treated with sealant, she had a moderate asthmatic reaction. During finger-painting activities, she had to wear nonlatex gloves, such as vinyl, neoprene, or polymer gloves. The clothing, toys in the room, and items brought in for

sharing time had to be carefully screened. Plugging in the VCR to show a videotape included contact with the latex-coated electrical cord. Pen grips, erasers on the end of a pencil, personal hygiene products in the bathroom, and touch-tone telephone keypads became allergy issues.

From transportation on field trips to computer mouse pads, cosmetics for Halloween makeup and school plays to hands-on materials for activities—it was incredible all that needed to be evaluated for latex. The information in Table 1 is offered as a guide to others who must face the same situation or are learning that they themselves are sensitive to latex.

Future Alternatives

Recently, researchers found that latex from a shrub called *guayule* contains far fewer proteins than does regular rubber. The problem was extraction. Guayule's latex is scattered throughout the plant's bark, so it is difficult to harvest. However, when latex produced from

guayule was tested on people with the most sensitivity to latex, no reaction occurred. Plant physiologists also hope to genetically alter annuals such as goldenrod and milkweed so they produce latex in commercially worthwhile quantities (Carey, Hastings, Holmes, and Kanigel, 1997; Cornish and Seiler, 1996).

As more students with special needs and complicated medical histories become members of classrooms, the likelihood of a severe latex reaction will increase and unless quick medical assistance is provided, a death could occur. Awareness of the numerous sources of latex in the classroom environment will help all teachers evaluate the materials they select for classroom and laboratory experiences and perhaps encourage the use of alternate materials that will not contribute to a possible reaction.

SANDRA A. HOLMES is an assistant professor of science education at Messiah College in Grantham, Pennsylvania.