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# Natural Rubber Latex

## A short history of its production, use and sensitizing features in the development of latex allergy in adults and children

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The naturally occurring substance, latex, is a milky white substance which, when the bark is cut, drips from the Brazilian rubber tree, *Hevea brasiliensis*, which is in the family, *Euphorbiaceae*. Recently, the guayule bush, *Parthenium argentatum*, has been a minor source of latex. (ref.<sup>1</sup>) Latex is also produced by the cells of various seed plants (as of the milkweed, spurge, and poppy families) but these have not been used commercially to any large extent.<sup>2</sup>

Historical evidence exists that South and Central American Indians used latex to make waterproof shoes and bouncing balls. European explorers brought this compound back to Europe. In 1790, Joseph Priestly, the British Chemist best remembered as one of the discoverers of the element, Oxygen, coined the term, "rubber," when he first noticed that this compound "rubbed" out pencil marks. The milky rubber tree sap, usually a white fluid, is crude latex. After harvesting, it is filtered to remove particulate debris; then it is preserved by adding either ammonia or sodium sulfite.

Rubber made from latex is called "Natural Rubber Latex" or "NRL". Depending on how the latex is manufactured, two kinds of Natural Rubber Latex (NRL) can be produced. Latex can be coagulated by the addition of acetic or formic acid to make crepe rubber which is used in hard products such as tires, rubber balls, and crepe rubber shoes. Liquid latex can also be processed by vulcanization to make thin, stretchy products such as rubber bands, balloons, condoms, rubber adhesive, and surgical gloves. Vulcanization is the process of heating latex with accelerators to speed up the procedure, anti-oxidants to make the product heat and chemical stable, and sulfur containing products to induce cross-linking between isoprene chains to produce a three-dimensional lattice. Compounds commonly used in the processing of latex include thiurams, dithiocarbamates, tetramethylthiuram monosulfide (TMTM), mercaptobenzothiazole (MBT), and isophenylamine.

Natural Rubber Latex is very popular because of its strength, flexibility, tear resistance, elasticity, and impermeability to bacteria and viruses. Thousands of common household items contain NRL, from shoes to pacifiers to rubber pants to kitchen cooking and storage materials.

Latex allergy is the result of the exposure of susceptible individuals to latex rubber proteins. The vast majority of latex sensitive people are only allergic to products made from liquid latex. Estimations of latex allergy range from 10-17% of all health care workers in the United States today.<sup>1</sup> The allergic response in these situations can be mediated by either Type I (IgE-mediated, i.e. Allergic Rhinitis, Urticaria, Asthma or Anaphylaxis) or Type IV (Cell-mediated, delayed hypersensitivity) mechanisms of the Gell and Coombs classification of allergic responses.

In Contact Dermatitis situations, the response can be merely irritant reactions to the occlusive physical properties of the mere act of wearing a glove, which is not an allergic reaction at all. Alternatively, the reaction can be cell-mediated atopic eczema, an allergic response not only to the latex itself, but also to contaminants in the production process of the latex.<sup>3,4</sup> As demand for more gloves increased geometrically after the Center for Disease Control issued its recommendation for universal precautions in 1987,<sup>5</sup> a rush to meet demand led to latex processing plants moving closer to latex harvesting sites, giving rise to fresher and possibly more potent antigens.<sup>6</sup> Other contaminants, including endotoxins, lipopolysaccharides unique to the outermost wall of Gram Negative Bacteria, have risen in their content in latex gloves, particularly the less expensive, non-sterile gloves, and these, too, have been implicated in the allergic response in latex-allergic patients.<sup>7</sup> These endotoxins were found mostly in the inside of gloves and were released as very small respirable particles that were not physically associated with the powder.

Type I, IgE-mediated allergic responses to airborne particulate latex particles are potentially far more severe reactions. Exposure is usually by inhalation of allergen carried by cornstarch powder with which most powdered gloves are coated to facilitate donning and removal.<sup>8</sup> The clinical manifestations of Type I, IgE-mediated latex allergy range from mild urticaria to fatal anaphylaxis.

Health care workers, patients with genitourinary tract anomalies requiring daily bladder catheterization, atopic patients, and patients with tropical fruit (avocado, banana, and chestnut) allergy have had life-threatening anaphylactic reactions.<sup>9,10</sup> Sensitive individuals may experience wheezing or flushing angioedema caused by contact of mucous membranes with latex products, such as with condoms, or dermatitis caused by household latex products, which may

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progress to anaphylaxis. Thus the clinical history is essential, and questions regarding latex hypersensitivity should be asked of all patients preparing to undergo surgery, hospital procedures or internal pelvic exams because these procedures may produce life-threatening allergic reactions.<sup>11</sup>

Occupational latex allergy in health care workers occurs almost exclusively as a result of exposure to latex rubber gloves.<sup>12</sup> Asthma caused by occupational exposure may persist even after the employee leaves the workplace. According to the Joint Position Statement of the American Academy of Allergy, Asthma & Immunology and the American College of Allergy, Asthma & Immunology concerning the use of powdered and non-powdered natural rubber latex gloves, such occupationally acquired asthma may lead to persistent impairment, and, rarely, to disability.<sup>12,13</sup>

Despite the majority of adult latex allergy being occupationally related in health care workers, children can and do develop sensitization to latex. Although multiple operations at an early age or urinary anomalies requiring daily catheterizations are well known risk factors for latex allergy in children, in a large study in Finland of children being evaluated for inhalant or food allergy, the prevalence of latex allergy was 1%. It is important to note that these children had already been identified as allergic individuals. The majority of children with latex allergy identified at screening or admitted because of suspicion of latex allergy belonged to the group

of children who had not undergone previous surgery.<sup>14</sup> Balloons, followed by gloves were the most common latex products causing allergic problems.

#### References:

1. Akl, M. Latex Allergy. *Resident and Staff Physician* 1997; 42(1): 21-26.
2. Ownby, DR. (Then) Director Allergy Research Laboratory, Henry Ford Hospital, Detroit Michigan. in Lecture at Latex Allergy Conference at Ala Moana Hotel, Honolulu, HI. Sponsored by The Queen's Medical Center, May 10, 1997.
3. Alenius, H, et al. Surgical latex glove allergy: characterization of rubber protein allergens by immunoblotting. *Int Arch Allergy Appl Immunol* 1991; 96(4): 376-80.
4. Hamann CP, Kick SA. Allergies associated with medical gloves: manufacturing issues. *Dermatol Clin* 1994; 12(3):547-59.
5. Centers for Disease Control. Recommendations for prevention of HIV transmission in health care settings. *MMWR*. 1987; 36;(suppl2): 1s-18s.
6. Hunt LW, et al. An epidemic of occupational akkergyto latex involving health care workers. *J Occup Environ Med*. 1995; 37; 1204-1209.
7. Williams PB, Halsey JF. Endotoxin as a factor in adverse reactions to latex gloves. *Ann Allergy Asthma Immunol* 1997; 79; 303-10.
8. Tomazic V, et al. Cornstarch Powder on latex products is an allergen carrier. *J Allergy Clin Immunol* 1994; 93(4): 751-8.
9. Rodriguez M, et al Hypersensitivity to latex, chestnut and banana. *Ann Allergy* 1993; 70: 31-34.
10. Fernandes de Corres L, et al. Sensitization from chestnuts and bananas in patients with urticaria and anaphylaxis from contact with latex. *Ann Allergy* 1993; 70: 35-39.
11. Kelly KJ, et al. The diagnosis of natural rubber latex allergy. *J Allergy Clin Immunol* 1994; 93(5): 813-816.
12. Position Statement. AAAAland ACAAI Joint Statement Concerning the use of powdered and non-powdered natural rubber latex gloves. *Ann Allergy, Asthma Immunol* 1997; 79(6): 487.
13. Paggiaro P, et al. Prognosis of occupational asthma. *Eur Respir J* 1994; 7: 761-7.
14. Ylitalo, L, et al. Natural rubber latex allergy in children who had not undergone surgery and children who had undergone multiple operations. *J Allergy Clin Immunol* 1997; 100(5): 606-612.



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