

Review II

A Natural History of Latex Allergy and Its Relationship with Health Care Workers

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Abstract: Latex allergy is an important issue in the health care profession as most patient contact involves at least some exposure to protective latex gloves on a daily basis. Although latex glove-allergy was first described among nurses in 1980, allergic reactions to natural rubber began as early as 1927. Japan's first case was reported in 1992, after which time the prevalence appears to have steadily increased. Recent studies have suggested the rate to be as high as 13.8% among operating room nurses. Individual reactions to latex range from mild hand itching, through to potentially fatal anaphylactic events. Differences in prevalence between various departments also suggest that risk varies from location to location, and between job descriptions. Health care workers are at high risk from this potentially serious disease.

Key words: Latex allergy, Health care workers, History, Relationship, Anaphylaxis

BACKGROUND

Natural rubber latex is a milky substance collected from *Hevea brasiliensis* trees originally discovered in Brazil during the 17th century, but now commercially grown in several Asian countries including Malaysia, Thailand and India ¹⁾. Following extraction as raw sap, latex is filtered and preserved by adding either sodium sulfite or ammonia. Upon drying, natural rubber latex quickly becomes unstable and does not retain its elastic properties unless treated in a process called vulcanization. Vulcanization refers to the gradual heating and addition of sulphur, which causes cross-linking of polymer chains and thus allows rubber to spring back to its natural shape when contorted ²⁾. Accelerators and antioxidants are also added during this process to

increase flexibility and longevity of the finished product.

HISTORICAL USAGE OF LATEX

Archeological evidence suggests that natural rubber latex was first processed and used by Mesoamericans in various balls sports as early as 1600 BC ³⁾. Between 1813 and 1830 assorted experimental rubber garments were invented and patented, although surgical gloves remained unfeasible due to the compound's innate chemical instability. An American surgeon, William Stewart Halstead, is generally credited with first introducing latex surgical gloves to protect the hands of his surgical nurses in 1889 ⁴⁾. However, the first regular user of latex gloves was Halstead's surgical intern at Johns Hopkins, Joseph Bloodgood, who began to use them in 1892. By the early 1900's, rubber gloves were becoming more common through-

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out the United States and Europe. Glove usage was reasonably widespread following World War I, although it was not until the AIDS epidemic of the early 1980's that the practice became routine for health care workers¹⁾. To date, glove usage remains one of the most important measures for the prevention of blood-borne disease transfer between patients and staff.

DEVELOPMENT OF LATEX ALLERGY

The first medical report of localized allergy to natural rubber latex occurred in 1927. A German physician, Grete Stern, reported hypersensitivity, urticaria and swelling in a patient exposed to a rubber dental prosthesis⁵⁾. In 1933, the first cases of delayed allergic reaction to rubber gloves were documented among electric company linesmen⁶⁾. Hand dermatitis from domestic rubber gloves also featured in the medical literature of 1960, although it appeared to be confined to housewives and other domestic situations⁷⁾. In 1979, Nutter reported the first, clear case of immediate allergic-reaction to natural rubber gloves among a British housewife⁸⁾. Less than a year later, Förström documented the first incidence of latex-induced immediate hypersensitivity reaction within a Finnish operating room nurse whenever she wore latex surgical gloves⁹⁾. Unlike previous reports, Förström's patient also developed simultaneous urticaria, rhinitis and edema of the eyes. This individual was to become both the first clinically-proven allergy to latex surgical gloves and also the first instance specifically affecting nurses. Refer to Fig. 1.

Anaphylactic reactions to latex gloves worn by others was first presented by Turjanmaa in 1984, who described 2 female nurses experiencing symptoms following contact with physicians' gloves during surgery¹⁰⁾. In 1987, Turjanmaa

1995	Discovery of lysozymes as a category of latex allergens
1993	First latex allergen identified as rubber elongation factor
1993	First case of latex glove-induced anaphylaxis reported in Japan
1992	First case of latex glove allergy reported in Japan
1989	First case of latex-induced anaphylaxis causing death
1989	First report of a cross-reaction between latex and food allergy
1989	First report of an anaphylactic reaction to latex condoms
1987	First study of latex sensitivity among hospital employees
1984	First report of an anaphylactic reaction to latex surgical gloves
1980	First report of an immediate reaction to latex surgical gloves
1979	First report of an immediate allergic reaction to rubber gloves
1960	First report of dermatitis due to domestic rubber gloves
1933	First report of a delayed allergic reaction to rubber gloves
1927	First report of an allergic reaction to natural rubber
1889	First use of latex gloves during surgical procedures

Fig. 1. Historical events in latex allergy

conducted the first epidemiologic study of immediate latex sensitivity reactions among hos-

pital personnel and found an overall prevalence rate of 2.9 %. This condition ranged widely however, from 1.6 % among laboratory workers, to 6.2 % within operating theatre staff¹¹). A possible association between latex allergy and atopy was also postulated at that time. Condom and balloon allergy was first described in 1989, among a nurse who experienced vaginal irritation and bleeding following contact with a latex condom. Within minutes generalized urticaria and respiratory distress had also developed, necessitating hospitalization for a period of 2 days¹²).

In the same year, a possible cross-reaction between food allergies and latex sensitization was suggested¹³). Again in 1989, Feczko reported what appears to be the world's first case of immediate latex hypersensitivity reaction causing death¹⁴). In this instance, a 49-year old American woman with a history of atopic dermatitis, allergic rhinitis and asthma experienced anaphylactic shock while undergoing a Barium contrast enema. The procedure included the insertion of a latex rectal catheter, which triggered mucous plugging of the bronchi, pulmonary edema and emphysema. Despite prompt transfer to the emergency department and significant resuscitation efforts, the patient died.

Japan's first case of latex glove allergy was reported as a contact urticaria at the 22nd Japanese Congress of Allergy in 1992¹⁵). However, 1 year earlier, Nakamura had mentioned an allergic reaction to powder emanating from latex surgical gloves¹⁶). In 1993 Bito outlined what appears to be Japan's first case of anaphylactic shock resulting from contact with latex gloves¹⁷). In this instance, a 24-year old nurse experienced anaphylactic shock following exposure to latex surgical gloves, necessitating hospitalization. Also in 1993, a protein known as 'rub-

ber elongation factor' was purified from raw natural latex and identified as the major causative allergen among human beings. Discovery of this compound was significant as it completely blocked specific IgE antibodies in the serum of latex sensitized patients¹⁸). The concept was further refined in 1995 when a Japanese research team classified lysozymes as one of the important latex allergens¹⁹). A latex-extracted lysozyme was found to be enzymatically very similar to fruit lysozymes, which may help explain the common cross-reaction between latex and fruit allergy in hypersensitive individuals.

EPIDEMIOLOGY OF LATEX ALLERGY

The percentage of staff affected by latex allergy varies from study to study, depending on which measurement instrument is used. Among health care workers, the worldwide prevalence is reported to be somewhere between 0 % to 30 %, with a 1-year new incidence rate of between 1 % and 2.5 %²⁰). Skin-prick tests and blood analysis of latex-specific antibodies have shown a prevalence rate among American and Italian hospital nurses of 17.6 % and 17.2 % respectively^{21,22}). A Japanese questionnaire-based study revealed 8.5 % of all hospital staff affected by immediate allergy to rubber gloves. Of these workers, nurses suffered one of the highest rates, with 19.2 % reporting either delayed or immediate-type latex sensitivity²³). Mitsuya investigated latex allergy in a Japanese hospital using clinical tests, and found the prevalence to be 4.6 % among all staff²⁴).

A multi-faceted hospital study was also conducted in Japan by Akita, which revealed latex allergy among 6.8 % of all nurses. When recalculated by department, the prevalence rate ranged from 0 % in the high care unit to 13.8 %

among operating theatre nurses²⁵⁾. Although Mitsuya²⁴⁾ found that screening for specific latex antibodies was probably the most reliable detection method, all studies demonstrated latex allergy to be a common condition among Japanese nursing staff as throughout the world. Differences in prevalence between various departments also suggest that risk varies from location to location, and between nursing job descriptions. Nonetheless, from these epidemiological reports it can be clearly seen that health care workers represent an important occupational group who are at high risk of developing latex allergy.

PREVENTION OF LATEX ALLERGY

The most effective strategy in dealing with glove allergy is to avoid contact with latex whenever possible. Although such measures may appear difficult in nursing practice, the National Institute of Occupational Safety and Health (NIOSH) has outlined ways in which they can be successfully achieved²⁶⁾. Firstly, non-latex gloves (such as plastic) can be used when exposure to infectious materials is unlikely. When latex gloves must be worn however, powder-free gloves with a low-allergen content may be utilized. Following contact with latex gloves, hands should be washed with a mild soap and thoroughly dried. Learning to recognize the symptoms of latex allergy is another important issue²⁶⁾. Skin rashes, itching, redness, nasal and eye symptoms following glove exposure should not be dismissed, and should be referred to a immunology physician for testing and/or treatment. Wearing a medical alert bracelet may also be of value for those who are known to suffer latex allergies.

CONCLUSION

In conclusion, this paper has shown that latex allergy is an important issue for health care workers in Japan as throughout the world. Although latex allergy is commonly viewed as a modern phenomenon, the disease's historical development over 75 years has also been outlined. As we enter the 21st century, it is imperative that an even greater effort be undertaken to prevent the further escalation of latex allergy among health care professionals.

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