

EDITORIAL

Occupational latex allergy: the magnitude of the problem and its prevention

During the past 15 years, type 1 hypersensitivity to latex has become one of the most prominent occupational hazards in the health care industry. Following early case reports of immediate sensitivity to latex in hospital personnel [1], the nature and size of the problem has been described. The full spectrum of IgE-mediated symptoms have been reported, ranging from localized urticaria and rhino-conjunctivitis [1] to asthma [2] and rarely anaphylaxis [3]. Most epidemiological studies have been cross-sectional – the majority undertaken in North America and Western Europe, [4–6] and a few in Eastern Europe [7] and the Far East [8,9]. Prevalence estimates vary widely (3–25%) according to the occupational group, the country of origin and the method of ascertaining type 1 hypersensitivity. Incidence rates for latex sensitivity derived from prospective studies are rare, but Sussman *et al.* found that approximately 1% of a group of Canadian hospital workers became newly sensitized to latex over a 1-year period [10]. This descriptive epidemiology has enabled a broad judgement of the level of risk. However, the focus of research in this field has shifted to exploration of risk factors for latex sensitivity and formulation of preventive strategies. Established risk factors include occupational exposure to latex [11], personal attributes such as atopy [4,12,13] and pre-existing hand dermatitis [4,8]. What then is the scope for the primary prevention of latex sensitivity in health care workers?

The first step in preventing occupational disease is the control of exposure. Indeed, in most westernised countries it is the legal duty of employers to reduce workplace exposures if they might give rise to ill health. Although latex is ubiquitous in the health care industry, surgical and examination gloves are by far the most common source and offer the most important opportunity for exposure limitation. Few studies have investigated the exposure–response relationship in detail, and differences in exposure measures make comparison of published work difficult. However, duration of glove wearing [14] and departmental glove consumption [11] have been positively associated with the likelihood of sensitization. Cornstarch powder, which has traditionally been added during glove manufacture to facilitate donning, appears to increase exposure to latex allergens both through direct skin contact and via the respiratory tract. Extractable latex protein levels in powdered gloves are higher than in nonpowdered brands [15]. Moreover, latex allergens have been identified from immunoblot analysis of cornstarch particles obtained from surgical gloves [16], and the size

of these particles is within the respirable range. Allergenic powder is thought to become airborne during donning and removal of gloves [15], and has been found in reservoirs on clothing and furniture raising the possibility of resuspension in room air [17].

In controlling latex exposure in a health care setting, the risk of allergy must be balanced against the risk of acquiring occupational infection, in particular blood-borne viruses. This balancing act is the principal impediment to the complete elimination of latex gloves from the workplace – the first step in a logical hierarchy of control measures. Substitution with alternative protective equipment is practically difficult. Latex has been shown to have a lower penetration rate to small viruses than polythene or polyvinylchloride gloves [18], and lower leakage rates during routine clinical activities [19]. In addition, elasticity, tactile properties and durability of latex glove products have been unrivalled. In recent years, glove manufacturers have produced reasonable alternatives made from synthetic copolymers. However, although these products are indicated for those with established latex sensitivity, the relatively high cost has mitigated against widespread use as a primary preventive strategy.

Although complete elimination is not feasible, there is some evidence that latex exposure can be reduced by rationalizing glove use. It has been shown that high latex aeroallergen levels ($>0.6 \mu\text{g}/\text{m}^3$) are associated with an increase in work-related respiratory symptoms [20] and that airborne latex loads are lower in health care workplaces where powder-free latex gloves are used compared with those using powdered brands [21–23]. Guidance from the UK Department of Health [24] has encouraged the control of glove use. This strategy has also been advocated in North America, in a joint statement from the American Academy of Allergy, Asthma and Immunology and the American College of Allergy, Asthma and Immunology [25], and in separate guidelines from the Food and Drug Administration (FDA) and National Institute for Occupational Safety and Health (NIOSH) in the USA and the Canadian Healthcare Association [26]. The common theme in these published guidelines is that for procedures where exposure to blood or body fluids is unlikely, latex gloves should be replaced with vinyl or other alternatives. However, if latex gloves are chosen because of the risk of infection or where specific glove characteristics such as dexterity are critical, then nonpowdered products with low protein residues should

be selected. The value of good hygiene to remove reservoirs of latex powder in the environment is also emphasized [26].

There are two main problems regarding the introduction of nonpowdered low protein glove policies. First is the lack of a standard approach for measuring the allergenic potential of latex gloves. Glove manufacturers provide some product information, usually extractable protein levels. However, it is difficult for purchasers and occupational health advisers to compare glove products when protein levels have been estimated using different methods. Current European standards of quality assurance relating to medical gloves specify acceptable physical barrier properties, but specifications for safety aspects such as allergenicity are not included [27]. New European standards that are under development propose to specify a single test method for determination of extractable protein from examination and surgeon's gloves. However, the paper by Mahler *et al.* in this issue [28] showed that total protein levels in different glove products did not always correlate well with latex allergen contents determined by IgE immunoblotting. The authors suggest that total extractable latex protein level is not suitable as a single measure of allergenicity. This work highlights the importance of establishing reliable standard measures of the potential of glove products to cause new cases of latex sensitivity.

The second problem is a paucity of published evaluations of a powder-free low protein glove policy as a primary preventive strategy in the health care sector. In one longitudinal study, no new cases of latex sensitivity were observed among hospital staff in areas where only powder-free latex gloves were used during a 1 year follow-up period [22]. However, no data from staff working in areas using powdered latex gloves was available for comparison. Disappointingly, an important prospective study among Canadian health care workers found no difference in the rate of new positive skin prick tests among subjects using powdered latex gloves compared to those using nonpowdered latex alternatives [10]. However, the authors have subsequently re-tested converters in the non-powdered intervention group and found them to be latex skin prick negative, suggesting that the reported lack of influence on the incidence of latex sensitivity may be attributable to observer bias [29].

Another approach to primary prevention is selection on the basis of personal risk factors. It is neither desirable nor feasible to use atopy as an exclusion criterion for health care workers. However, some occupational physicians selectively advise individuals with hand dermatitis to avoid latex gloves completely, and to use copolymer alternatives for procedures involving a risk of infection.

The key to secondary prevention of latex-related symptoms is the early identification of sensitization. Education of exposed health care workers is crucial. Formal health

surveillance to detect symptoms of immediate allergy is indicated if the risk of sensitization cannot be controlled by reducing powdered glove use. However, the significance of reported symptoms must be confirmed by skin prick or glove use tests. The widespread use of powder-free low allergen latex gloves will facilitate the reduction of symptoms in those who are already sensitized by reducing exposure to airborne latex allergens [24]. This will greatly increase the likelihood of preserving employment in latex-sensitive health care workers. Mahler's study gives useful insight into the relationship between *in vitro* measures of allergen and protein content of gloves and the tendency to provoke reactions in those already sensitized. However, we still do not understand clearly how direct skin exposure to latex affects the progression of allergic symptoms from localized urticaria to anaphylaxis. Therefore, we must advise sensitized health care workers against wearing latex gloves, even if they have been shown to be of low allergenicity by *in vitro* and *in vivo* methods. For this group, the risk of serious allergic reactions to latex gloves probably outweighs the risk of infection associated with using suitable nonlatex (copolymer) substitutes.

In summary, the high profile of latex allergy among occupational health professionals, employee groups and enforcers of health and safety legislation is attributable to the high prevalence of symptoms, the fatal potential of some reactions and the large number of health care workers who are exposed to latex products. Based on good indirect evidence, exposure control through nonpowdered low protein glove policies is widely supported as the mainstay of prevention. However, the small body of direct evidence from intervention studies is inconclusive at present. To guide our preventive efforts, further work is needed to standardize the assessment of glove allergenicity and to clarify the impact of glove control policies on the incidence of latex sensitization in health care workers.

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