

# Atopy and other risk factors for UK dentists reporting an adverse reaction to latex gloves

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A study was conducted to assess the significance of a personal history of atopy and other risk factors for UK dentists reporting an adverse reaction to natural rubber latex (NRL) gloves. 2535 dentists completed a self-administered questionnaire and, of these, 1034 (group 1) reported an adverse reaction to NRL gloves and 1501 (group 2) did not. Risk factors investigated were: sex, years in clinical practice, exposure to gloves and a history of atopy or food allergy. The signs and symptoms reported by group 1 dentists were recorded. Logistic regression analysis was used to identify a set of risk factors that produced the most discrete model for a dentist reporting an adverse reaction to NRL gloves. A personal history of atopy was a significant risk factor. Dentists with a history of eczema and hand eczema in childhood were most likely to report an adverse reaction to NRL gloves.

*Key words:* rubber gloves; natural rubber latex; dentist; atopy; skin complaints; questionnaire; health care workers; occupational. © Munksgaard, 1998.

*Accepted for publication 15 October 1997*

The use of protective gloves among health care workers, both in the hospital and the community, has become widespread with the growing awareness of the risk of HIV and hepatitis infection (1). Adverse reactions to latex gloves among health care personnel and, to a lesser extent, patients, are, however, causing concern and there are also increasing reports of occupationally-acquired latex allergy (1). Type I, IgE-mediated reactions to natural rubber latex (NRL) range from localized urticaria to life-threatening anaphylaxis and are, therefore, of greatest concern (1, 2). The prevalence of latex allergy in health care workers is between 7 and 10% (2).

Dental practitioners in the UK are now required to wear protective gloves for the treatment of all patients (3) and the majority wear examination gloves made from natural rubber latex (NRL) (4). Dentists are at risk from latex sensitization as well as of developing an allergic or irritant contact dermatitis on their hands (5, 6). A survey of self-reported reactions to NRL gloves among 1200 UK dentists showed a prevalence of 29% for skin irritation attributed to glove wearing (4) and in a study of oral health care workers in the US, 38% indicated that they had a history of some type of

reaction to NRL gloves (7). A Swedish investigation revealed that 24% of dental personnel reported skin symptoms related to glove use (8). Risk factors for latex sensitization have been identified as regular exposure to NRL, a history of atopy (2) and, more recently, food allergy, particularly to fruits such as avocado and bananas (9, 10).

Atopy has been identified as a risk factor for both latex sensitization (2) and irritant contact dermatitis (11, 12) and health-care workers with atopic allergy have been reported to have a 24% prevalence of a positive result for latex prick tests (13). The aim of the present study was to investigate the significance of atopy and other risk factors, associated with UK dentists reporting an adverse reaction to NRL gloves.

## Materials and Methods

2 groups of dentists were identified from 2535 respondents who had completed a questionnaire survey circulated to members of the British Dental Association. Group 1: 1034 dentists who reported an adverse reaction that they attributed to wearing NRL gloves; group 2: 1501 dentists who reported no reaction. An adverse reaction to latex gloves

included chapping or cracking of hands, itching, rash, hives (urticaria), itchy or watery eyes, sneezing, shortness of breath, facial swelling and anaphylaxis. All dentists in the survey were involved in clinical dental practice and wore NRL gloves routinely to treat patients.

Participants in the survey were asked questions concerning sex, length of time in clinical practice, number of years wearing gloves, exposure to NRL gloves and questions related to a personal history of atopy and food allergy. An atopic history included asthma, hay fever, hand eczema in childhood (<15 years of age) and eczema elsewhere on the body. Group 1 dentists were also asked to specify specific signs and symptoms that they attributed to wearing NRL gloves.

Logistic regression analysis was used to identify a set of variables that, taken together, produced the most discrete model for the risk of a dentist developing a self-reported reaction to NRL gloves. The following variables were entered into the analysis; sex, number of years in clinical practice, exposure to gloves (years wearing NRL gloves, number of sessions worked and number of gloves worn per session), a personal history of atopy (asthma, hay fever, eczema and hand eczema in

childhood) and food allergy. A stepwise selection procedure was used to select variables for inclusion in the model with a 0.05 level for entry. The dependent variable was, whether or not, the dentist reported an adverse reaction to NRL gloves. The statistical package used was SPSS for Windows, version 6.1.

## Results

The signs and symptoms reported by dentists in group 1 are shown in Table 1. The number of atopic conditions given by group 1 dentists and the % reporting an adverse reaction to latex gloves is shown in Fig. 1. The logistic regression model for dentists reporting a reaction to latex gloves is shown in Table 2, together with selected variables and their respective coefficients and odds ratios. The odds ratio for each variable estimates the relative risk of a self-reported reaction to NRL gloves. A personal history of eczema, hand eczema (in childhood), asthma and hay fever, together with number of years in clinical practice and sex, were all significant risk factors for a dentist reporting an adverse reaction to NRL gloves. Based on the logistic regression model (Table 2), a history of

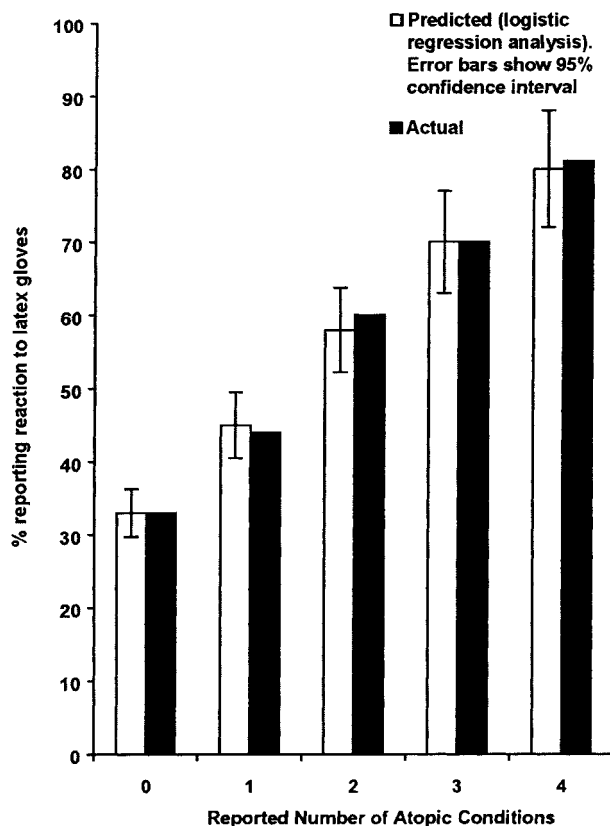


Fig. 1. Number of atopic conditions and % of group 1 dentists reporting adverse reaction to latex gloves.

Table 1. Signs and symptoms (%) reported by group 1 dentists

| Signs and symptoms                                                      | Prevalence (%)<br>among dentists<br>group 1 |
|-------------------------------------------------------------------------|---------------------------------------------|
| itching of hands                                                        | 83.3                                        |
| rash on hands                                                           | 68.0                                        |
| chapping or cracking of hands                                           | 60.1                                        |
| hives on hands                                                          | 39.1                                        |
| itching & hives on hands                                                | 37.5                                        |
| itchy or watery eyes                                                    | 27.0                                        |
| runny nose/sneezing                                                     | 20.0                                        |
| runny nose/sneezing and itchy (or watery)<br>eyes                       | 14.8                                        |
| itching and hives on hands and runny<br>nose and itchy (or watery) eyes | 8.0                                         |
| difficulty breathing                                                    | 4.8                                         |
| facial swelling                                                         | 4.4                                         |
| difficulty breathing and facial swelling                                | 0.9                                         |

Table 2. Logistic regression model for dentists reporting an adverse reaction to latex gloves (yes/no)

| Variable                                   | Coefficient | Odds<br>ratio | 95%<br>confidence<br>interval |
|--------------------------------------------|-------------|---------------|-------------------------------|
| hand eczema as child                       | 0.688       | 1.989         | (1.357, 2.915)                |
| eczema                                     | 0.634       | 1.885         | (1.501, 2.368)                |
| less than 10 years in<br>clinical practice | 0.500       | 1.647         | (1.377, 1.972)                |
| asthma                                     | 0.496       | 1.643         | (1.255, 2.151)                |
| female sex                                 | 0.370       | 1.448         | (1.217, 1.722)                |
| hay fever                                  | 0.339       | 1.403         | (1.163, 1.692)                |

hand eczema in childhood, with an odds ratio of 2, carries the highest risk for a dentist developing an adverse reaction to NRL gloves. The predicted prevalence of an adverse reaction, based on the proposed logistic regression model for a dentist having a history of 1 or more atopic conditions, is shown in Fig. 1 and correlates well with the reported prevalence of group 1 dentists. The results of the logistic regression analysis did not show the following variables to be significant risk factors for an adverse reaction: number of years routinely wearing gloves, number of sessions currently wearing gloves and number presently worn per session and a history of food allergy.

### Discussion

This survey appears to be the largest dental, or medical, cohort study reported in the literature, concerning self-reported reactions to NRL gloves. The results have shown that a personal history of atopy is a significant risk factor for dentists developing an adverse reaction to NRL gloves; individuals with a history of 4 atopic conditions are at greatest risk. Atopy has been shown in other studies to be a risk factor for both latex sensitization (2, 13) and irritant contact dermatitis (10, 11), but not for allergic contact dermatitis (14, 15). A French, prospective study of risk factors involved in NRL hypersensitivity included 569 subjects who routinely underwent skin prick tests for latex sensitization, as well as who answered a questionnaire aimed at revealing risk factors. Positive prick tests were obtained in 6.85% of non-atopic subjects exposed to latex, and 36.36% of the latex-exposed atopic subjects. This French study showed that, as risk factors, atopy and exposure were synergistic. A survey among 526 staff at an American dental school showed that a previous history of hand eczema, asthma and allergies (specifically food and contact allergies) was significantly higher in respondents reporting an adverse reaction to NRL gloves (17). In a recent study of 203 Canadian dentists and dental students, a previous history of atopy and eczema, a family history of eczema, contact dermatitis and respiratory symptoms with latex exposure, were all shown to be risk factors for latex sensitization (5). Of the 131 of dental personnel tested, 10% had positive skin tests responses to NRL (5), which is similar to that reported in operating theatre personnel and other hospital workers (2). The Swedish study, which examined glove-related skin symptoms among operating theatre and dental care unit personnel, showed that 2× as many subjects with a history of atopy and hand dermatitis reported glove intolerance as did personnel with no such history (8). The findings of

the present study correlate well with this Swedish study as the odds ratio for hand eczema in childhood was 2. Wrangsjö et al. (8) found that the overall prevalence of latex sensitization (positive SPT and/or presence of measurable latex serum IgE antibodies to latex allergens) among dental personnel was 2.1%, and less than the 10% of cases of glove-related skin complaints reported in their interview investigation of Swedish hospital and dental workers. Accurate comparisons between prevalence studies of latex sensitization are not possible, however, as diagnostic techniques and their interpretation may vary (18). The present investigation showed a high prevalence of cutaneous symptoms among group 1 dentists and this was consistent with previous studies (4,5). 'Itching' and 'hives' was reported by 37.5% of group 1 dentists and these signs and symptoms have been statistically correlated to positive prick tests to NRL in 2 previous studies (5, 19). Other studies have shown, however, that reported glove-related skin symptoms are not specific signs of IgE-mediated latex allergy (20–22). 8% of dentists in group 1 reported itching and hives, a runny nose, and itchy (or watery) eyes as a reaction to NRL gloves, and this combination of cutaneous and upper respiratory symptoms is suggestive, but not diagnostic, of an IgE-mediated response to NRL (19).

Female dentists in the present study, were statistically more likely to develop a self-reported reaction to NRL gloves, and this female preponderance has been noted in previous investigations among UK dentists (4). Women may have a lower threshold for reporting an adverse reaction, though hand dermatitis generally has been shown to have a higher prevalence among females (12, 23, 24). Dentists who had been in practice for less than 10 years were significantly at greater risk of developing a self-reported reaction to NRL gloves than those who had been in practice for more than 10 years, but the reason for this remains unclear. When glove-wearing was first introduced into dentistry in the 1980s, many dentists wore gloves selectively for patients or procedures perceived as being 'high risk' for transmission of HIV or hepatitis (24). Consequently, these dentists did not have their hands in more-or-less continuous contact with NRL gloves. Dentists qualifying within the last 10 years would, however, have been introduced to routine glove use as undergraduates and are likely to have continued this practice after qualification.

An inherent difficulty with this self-reported survey is that adverse reactions attributed to NRL gloves by dentists could also have been caused by other environmental factors. Exposure to chemicals and resins used in dental practice may result in

allergic contact dermatitis, and poor hand hygiene frequently results in irritant contact dermatitis. A pre-existing hand eczema can also be exacerbated by occlusion with NRL gloves, and excessive sweating creates a moist environment with an added potential for irritant contact dermatitis (6). Eczematous hand dermatitis disrupts the skin barrier and may predispose to NRL allergy (2). Progression can occur from localized (hand) to generalized (anaphylactic) allergic responses (26). No attempt was made in this statistical evaluation of risk factors to differentiate between non-allergic and allergic (immediate or delayed) responses, as the diagnosis of glove allergy is dependent on specialist evaluation and verification by appropriate testing, using potential glove allergens. Most investigators agree that prick testing is the best method for screening and diagnosing NRL allergy (27). The study by Wrangsjö et al. (18) concluded however, that the majority of skin complaints from gloves are caused by skin irritation rather than by allergy.

Self-reported retrospective studies, despite inherent problems relating to difficulties of recollection and observation by participants, can generate important information concerning risk factors for health-care workers developing an adverse reactions to NRL gloves. The present investigation has confirmed that atopy is a significant risk factor for UK dentists developing an adverse reaction to NRL gloves, and responses ranged from cutaneous to respiratory signs and symptoms.

Hospital staff, GPs, paramedics, and other health-care personnel with direct patient contact now wear NRL gloves, but dentists tend to have their hands covered more often and for longer periods per week than any other health-care group. The long-term effects of regularly donning gloves during a working life time remain unknown, and so it is essential that all health care workers take maximum precautions with hand protection. Hand care, including correct techniques for hand disinfection, should be taught early in the medical and dental undergraduate curriculum and all health-care workers must become knowledgeable concerning glove selection, to minimise glove-related problems and sensitization to NRL. Unfortunately, health care cost containment has resulted in the use of latex gloves that unknowingly contained high levels of allergens and extractable NRL proteins (28). Health-care personnel who wish to minimise their chances of becoming sensitized to NRL proteins, or developing an adverse reaction to gloves, should choose an NRL glove that is powder-free and low in residual accelerators and extractable latex proteins (5, 29). Recent research has yielded specific methods for measuring

NRL allergens in gloves and this progress has already led authorities in Finland to inform consumers of the highly allergenic glove brands on the market (27).

Atopic eczema in childhood is known to predispose to adult hand eczema (30) and Rystedt (31) established that a history of hand eczema in children before the age of 15 years carries a particularly bad prognosis. The present investigation has shown that a personal history of eczema and hand eczema in childhood were significant risk factors for dentists developing an adverse reaction to NRL gloves. Adolescents who are considering a career in dentistry and have a history of atopic eczema should, therefore, be counselled about the increased risk of glove intolerance and sensitization to NRL (32).

### Acknowledgements

The author thanks Dr. John Davies, Computing Services, The University of Liverpool, for his assistance with the database, and Ms J. Field who assisted with data collection. This study was supported by a grant from Regent Hospital Products.

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