

Long-term outcome of 160 adult patients with natural rubber latex allergy

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Allergy to natural rubber latex is a major occupational problem in the health care sector and a problem even in other occupations in which protective gloves are used. There is little information available about the long-term outcome at work in large patient populations. To study the occupational outcome when all gloves in the working environment were changed either to low-allergen latex or non-latex gloves, in 1995 to 1996 we re-examined 160 of 174 adult subjects who were diagnosed with natural rubber latex allergy between 1982 and 1994 after a median of 3 years (range, 0.5 to 24 years) after the diagnosis. The outcome in daily work or as a patient in health care was investigated with the use of a questionnaire. Special attention was paid to the assessment of the occurrence of hand eczema. Glove selection policy as an intervention in the treatment of natural rubber latex allergy is described. Of 71 health care workers and 89 non-health care workers, 72% and 83% were atopic; 54% and 65% had hand eczema at the time of diagnosis, and 89% and 19% had work-related allergy to natural rubber latex, respectively. On re-examination, none of the health care workers had changed work because of natural rubber latex allergy, and only 38% had hand eczema (significant decrease). Ninety-eight percent of the non-health care workers, of which 58% had hand eczema, continued with their previous jobs. The use of low-allergen latex or non-latex gloves throughout the health care sector seems to be an adequate step for health care workers who have natural rubber latex allergy; non-health care workers get along with personal avoidance of latex gloves if they are not working directly with natural rubber latex-containing materials in production. (*J Allergy Clin Immunol* 2002;110:S70-4.)

Key words: Latex allergy, occupational, hand eczema, skin prick test, challenge tests

Allergy to natural rubber latex (NRL) products is a well-known problem in health care, where 3% to 17% of workers have become sensitized and most of them have an occupational allergy to NRL. There are only few reports

Abbreviations used

HCW: Health care worker
NRL: Natural rubber latex
SPT: Skin prick test
TUH: Tampere University Hospital

that deal with long-term follow-up of such subjects; in those studies, the general outcome has been rather poor.^{1,2} In a study that comprises 203 dental practitioners and students, 10% of 131 subjects who had a skin prick test (SPT) were positive to NRL. Positive responses were seen from year 2 of clinical practice and glove use, which confirms the importance of latex gloves as the main cause of NRL allergy.³ Accordingly, a preliminary report showed that sensitization to NRL could be prevented in dental students by the prophylactic selection of low-protein, powder-free gloves.⁴ So far, little information has been available to show how patients in occupations other than health care manage with NRL allergy.

The aim of this follow-up study was to determine the impact of careful diagnosis, appropriate information, and change to low-allergenic latex or non-latex gloves on how employees manage in their daily work.

PATIENTS AND METHODS

Between 1982 and 1994, 213 patients were diagnosed with allergy to NRL at the Department of Dermatology, Tampere University Hospital (TUH). Thirty-nine patients were children, who have been discussed elsewhere.⁵ One hundred sixty of 174 adult patients (health care workers [HCWs], 71 [44%]; non-health care workers [non-HCWs], 89 [56%]) were followed. The median duration of symptoms before the diagnosis was 3 years (range, 0.5 to 30 years). The mean age at diagnosis was 36 years (range, 23 to 56 years) for HCWs and 36 years (range, 18 to 69 years) for non-HCWs. Fifty-two percent of the HCWs and 76% of the non-HCWs had a history of atopic eczema and/or allergic rhinitis and/or asthma. The diagnosis of NRL sensitization was based on a positive skin prick test (SPT; mean wheal diameter at least 3 mm when negative control was zero) and/or the presence of specific IgE antibodies to NRL with CAP RAST (Pharmacia). The diagnosis of allergy was based on compatible symptoms in connection with a history of exposure to NRL products or a positive skin challenge test with a latex glove (Exona; Triflex) as described elsewhere.⁶ Eluates made from high-allergenic gloves (Exona; Triflex) were used for the SPT, later also a commercial NRL allergen from Stallergènes SA (Antony Cedex). In addition, 102 of 160 patients with NRL allergy were patch tested with the standard patch test series that is recommended by the international contact dermatitis research group. It was emphasized that all patients were diagnosed, informed, and followed by the same physician (K.T.).

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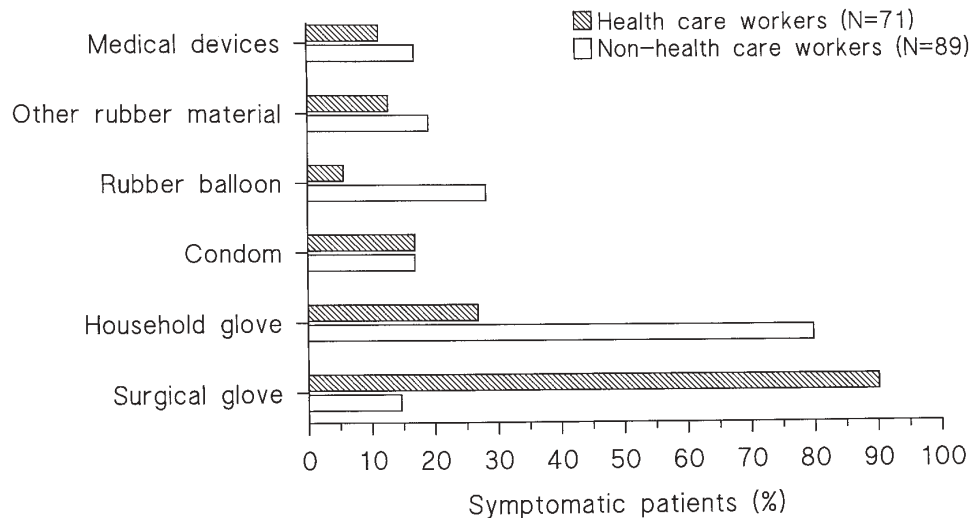


FIG 1. Exposure to NRL products that cause primary symptoms in HCWs and in non-HCWs who are allergic to NRL.

TABLE I. Symptoms from exposure to NRL at the time of diagnosis in 160 patients with NRL allergy

Symptom	HCWs (n = 71)		Non-HCWs (n = 89)		Total	
	N	%	N	%	N	%
Contact urticaria	56	79	46	52	102	64
Hand eczema	29	41	30	34	59	37
Eye symptoms	23	32	14	16	37	23
Facial edema	9	13	25	28	34	21
Generalized urticaria	4	6	12	13	16	10
Rhinitis	11	15	11	12	22	14
Asthma	2	3	11	12	13	8
Anaphylaxis	5	7	7	8	12	8

From 1982 to 1990, with the exception of 15 HCWs with NRL allergy who were diagnosed during a hospital screening study, only those patients with a positive history that suggested NRL allergy had an SPT with latex allergens.⁷ Since 1990, NRL allergens have been included in routine series for common inhalant allergens at the Department of Dermatology. The patients were queried about the latex products that first elicited symptoms and the nature of the symptoms (Fig 1; Table I), which ranged from contact urticaria, eczema, eye symptoms, facial edema, generalized urticaria, rhinitis, and asthma to anaphylaxis (ie, all stages of the contact urticaria syndrome) as described by Maibach and Johnson.⁸ Contact urticaria was the most common symptom; but hand eczema was frequently present in both patient groups. Anaphylactic reactions were recorded in 12 patients (8%); 7 reactions had occurred in non-HCWs. In 11 patients, the reaction had occurred during a medical intervention; in 1 patient the reaction occurred during a glove challenge test with 2 high-allergenic gloves on eczematous skin, as described elsewhere.⁹ Persons who work in different sectors of health care or otherwise use sterile surgical gloves in their work (eg, workers in an eye drop plant) were regarded as HCWs. If the appearance of symptoms was clearly connected to exposure to latex products under occupational conditions, the disease was diagnosed as work related. A medical certificate of occupational disease was submitted to the insurance company; once accepted, NRL allergy was entered into the Register for Occupational Diseases kept by the Institute of Occupational Health in Helsinki, where occupational contact urticaria has been classified as a distinct occupational skin disease since 1989.¹⁰

One hundred sixty adult patients gave informed consent and volunteered for a follow-up study in 1995 and 1996. The median follow-up time was 3 years (range, 0.5 to 11 years). They filled in a questionnaire that dealt with suspected latex-related symptoms either at home or at work and as a patient in health care. Specific IgE to NRL was re-estimated in 38 patients. Hand eczema and outcome at work were thoroughly investigated. The study protocol was approved by the Ethics Committee of the TUH.

Glove selection as an intervention

Most of the present patients date back to the time when the first cases of latex allergy were diagnosed in Finland. It was evident from the beginning that the allergenicity of the latex gloves used in the hospital varied greatly.¹¹ Since the late 1980s, a committee has selected gloves for the TUH, using 3 criteria for glove purchase: low allergenicity, good quality in barrier function, and affordable price. The allergenicity of gloves was studied by SPT voluntary patients with NRL allergy with 1:5 wt/vol eluates of gloves. Only latex gloves that showed no response on their skin were accepted. Since 1990, only low-allergenic, but normally powdered, latex gloves have been used in the whole hospital; no latex-free operation rooms were set up. The same regimen was followed by other smaller hospitals and health care centers within the Pirkanmaa Hospital District, which encompasses 435,000 inhabitants. The allergenicity of the gloves that were selected was later estimated by the IgE-enzyme-linked immunosorbent assay method; the results have been reported biannually since 1995 by the National Agency for Medicines in Finland in Finnish and in English.^{12,13}

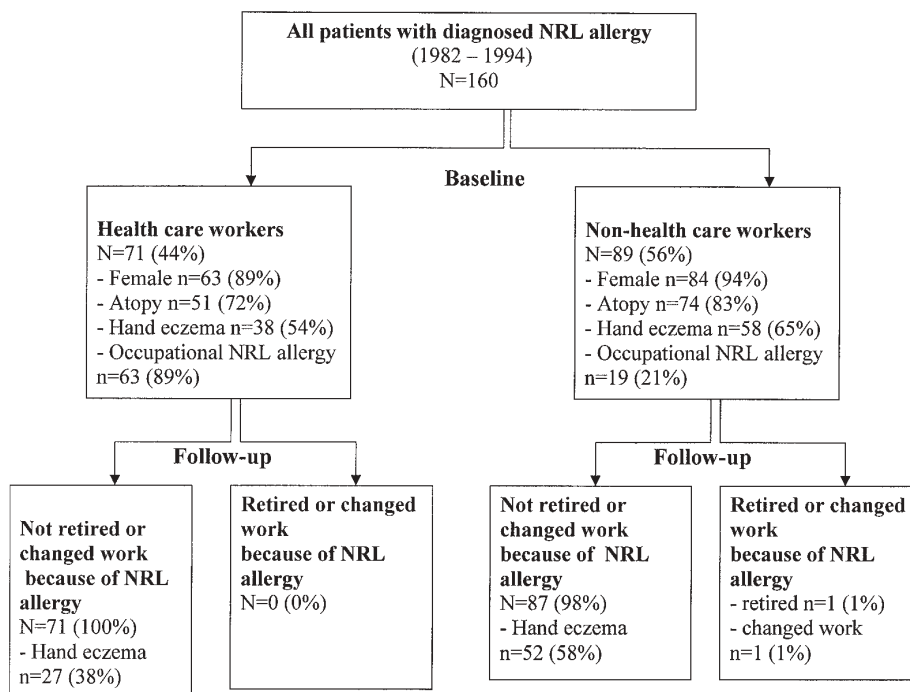


FIG 2. Follow-up results of 160 patients with NRL allergy.

RESULTS

Findings at diagnosis

SPT, RAST, challenge tests. The SPT results were positive in all but 3 patients who were challenge-positive but negative to latex-RAST. In the 157 patients whose SPT results were positive, latex-RAST was positive in 62% (observed agreement, 63%; 95% CI, 55 to 71). SPT results were also positive to NRL in 13 of 71 HCWs (18%) and 33 of 89 non-HCWs (37%) who did not recall any symptoms from NRL products, although they could be diagnosed with NRL allergy in our further studies. This happened significantly more often in non-HCWs ($P = .009$, chi-square test). Glove challenge test was performed in 37 patients, who all showed positive reactions either on 1 finger or on the entire hand.

Occupational NRL allergy. Among HCWs, NRL allergy was work related in 63 of 71 workers (89%) and, among non-HCWs, in 19 of 89 workers (21%; Fig 2). The occupations of the workers with allergy are presented in Table II.

Follow-up

Symptoms from NRL products during the follow-up. No anaphylactic reactions occurred during the follow-up. Seven patients exhibited mouth itch, wheals on the face, and/or facial edema during or after dental treatment, which they connected to the latex glove use of the dental personnel. The symptoms did not require more than occasional intake of antihistamines for treatment. One

patient exhibited wheals on the abdominal skin from ultrasonography. Nine patients complained about itching from different kinds of rubber bands; they even had to select their underpants carefully. One patient had itching from a condom. Two patients told that touching certain rubber products (carpet, dog's teether) caused them facial itch if they did not wash their hands before touching their face. Four patients had symptoms from balloons: itchy eyes, swelling of the lips and face, and asthmatic symptoms. Afterwards, the patients had no problems recognizing what had caused their reactions.

Patch tests. One hundred two of 160 patients with NRL allergy were patch-tested with the standard series. Eighty-eight patients remained negative, whereas 14 patients showed positive reactions: 7 reactions to thiuram mix, 2 reactions to thiuram mix and carba mix at the same time, 1 reaction to mercaptobenzothiazole, 1 reaction to paraphenylenediamine mix, 2 reactions to nickel sulfate, and 1 reaction to acrylates.

Hand eczema. Between the time from diagnosis to follow-up, the prevalence of hand eczema diminished from 54% to 38% in HCWs ($P = .019$, McNemar test) and from 65% to 58% in non-HCWs ($P = .286$, McNemar test; Fig 2).

Specific IgE. Values of specific IgE to NRL were available both at the beginning and at the time of follow-up in 38 patients. No statistically significant differences were noted, with median latex-RASTs of 2.0 KU/L (range, 0 to 73 KU/L) and 0.8 KU/L (range, 0 to 68 KU/L), respectively ($P = .24$, Wilcoxon signed ranks test).

Outcome at work and effect of glove selection. Within the health care sector, no employees had to change tasks within the same working place or to retire because of latex allergy, but 2 non-HCW men had to stop working in the rubber band plant (Fig 2). Their respiratory symptoms continued to worsen. Another 2 workers in the same plant had retired because of occupational asthma of unknown cause before the study had started. The real reason for their allergy symptoms was not revealed until this study.

Most of the HCWs with NRL allergy still use low-allergenic latex gloves; only 4 doctors, 1 nurse, and those individuals with previous anaphylactic reactions need latex-free gloves. In non-health care occupations, the patients were told to use vinyl or other non-latex protective gloves. At diagnosis they were provided with lists of brands and availability of suitable gloves. When difficulties with the employers came up, the employers were contacted by phone or letter, which always led into the acceptance of suitable gloves. The dissemination of information about prices of low-allergenic latex versus normal latex gloves was effective.

DISCUSSION

The general outcome of the re-examination was very good. Only 2 workers at a rubber band plant had to change their tasks or to retire; the rest of the patients continued with their old jobs. This may be due to the fact that NRL allergy has been exceptionally well recognized within the TUH since the mid 1980s.

In the present study, we paid special attention to the occurrence of hand eczema, which diminished significantly in HCWs during the follow-up, but not in non-HCWs. This may be due to better information among HCWs about skin care typical of irritant eczema. Another explanation may be that eczema was partly caused by NRL proteins, so-called *protein contact dermatitis*, and a change to low-allergenic gloves had a favorable effect, as observed in our previous studies.¹⁴ Part of the clearance of hand eczema may be due to the avoidance of certain antigenic rubber chemicals that were observed with patch tests in 11 patients. Minor symptoms from NRL products outside of the workplace were reported by 24 of 160 patients, but there were no anaphylactic reactions. No hospital care was needed.

The change of gloves in the whole health care sector in the TUH and within the Pirkanmaa Hospital District to low-allergenic latex gloves in 1990 resulted in a sufficient intervention policy for the workers with NRL allergy. Only a few of them needed totally latex-free gloves, but those workers did not have symptoms from the low-allergenic latex gloves that were used by coworkers, even though the gloves were powdered. This observation supports the assumption that powder itself, when not contaminated with NRL-allergens, is innocent as an allergen.

Only few studies had dealt earlier with the effect of voluntary glove selection in relation to clinical outcome of patients with NRL allergy. The outcome of a partial change of gloves has not been favorable. Avoidance of

TABLE II. Occupations of 63 HCWs and 19 non-HCWs with work-related allergy to NRL

Occupation	N
HCW (n = 71)	
Physician	21
Nurse	22
Dentist	1
Dental nurse	7
Laboratory nurse	4
Other medical occupations	5
Worker in an eye drop plant	3
Non-HCW (n = 89)	
Farmer	1
Farmers' wife	3
Kitchen worker	4
Cleaner	4
Textile worker	2
Worker in a rubber band plant	4
Paper mill worker	1
Private care taker	1

latex examination gloves seems not to be effective in the prevention of sensitization, if the use of powdered surgical latex gloves is not discontinued.¹⁵ In the studies of Wrangsjö¹ and Taylor and Praditsuwat,² only the affected person changed to non-latex gloves, and the outcome of their patients was rather poor. Several persons with NRL allergy had to change work assignments, but those persons who continued with their previous jobs continued to have allergy symptoms and sick leaves. Allmers et al¹⁶ showed a decrease in latex-specific IgE antibodies in HCWs with NRL allergy who avoided all latex products when, at the same time, powdered latex gloves were eliminated from the work places. Unlike the recommendations of Allmers et al¹⁶ to give latex-free gloves and other latex-free materials to HCWs with NRL allergy, most HCWs with NRL allergy in the TUH and Pirkanmaa Hospital District are encouraged to use low-allergenic latex products if they have not observed any adverse reactions from using them. During the long follow-up period, most patients managed well without a worsening of symptoms, and only a few of them needed latex-free gloves. This could naturally be risky because there is no information that tells how often patients with contact urticaria only proceed to more general symptoms.

In the TUH, NRL allergens have been included in the common inhalant series since 1990. In agreement with this, Poley and Slater¹⁷ also recently emphasized the importance of screening asymptomatic individuals or symptomatic patients with the aim of the prevention of latex allergy. In this study, 13 HCWs (18%) and 33 non-HCWs (37%) were unexpectedly positive to NRL-SPT and could in provocation tests or with a more careful history be defined as persons with NRL allergy. This happened significantly more often in non-HCWs, which may be related to the better knowledge about symptoms of NRL allergy among HCWs.

In conclusion, for the first time, a large cohort of adult patients with NRL allergy have been followed to see the

outcome under circumstances in which the entire health care sector has changed to low-allergen gloves and the non-HCWs have changed to totally latex-free gloves. In our series, all HCWs could continue in their old work assignments; most of them even continued using low-allergen latex gloves, and the prevalence of hand eczema diminished significantly. Only a few of the patients needed latex-free gloves. Among non-HCWs, the outcome was good in occupations in which latex-free protective gloves could be used. For people who work directly with NRL-containing materials in production, exposure to the material could not be avoided, and workers with NRL allergy had to quit their jobs. Careful diagnosis and counseling of not only NRL-allergic workers but also employers are important to the achievement of an optimal outcome with glove selection. Information and education of all HCWs is another important goal. Without understanding the nature of NRL allergy, HCWs who do not have NRL allergy may not be willing to change gloves to help their coworkers.

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