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Case Report OMICS International

Occupational Dermatitis Caused by Vulcanization Accelerator of Gloves

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Abstract

Three cases of occupational dermatitis due to additives to rubber gloves are discussed. These cases were not a result of latex allergy and their dermatitis caused by vulcanization accelerator in rubber gloves.

Most people have heard of latex allergy, and some people avoid the use of latex products. However, some rubber-related contact dermatitis of hands is caused by additives such as vulcanization accelerators, which are an essential additive for the production of rubber gloves. Our patients have used rubber, plastic or leather gloves for working, and the results of patch testing (using ICDRG criteria) showed positive reaction against vulcanization accelerators that were used in their gloves.

Keywords: Occupational dermatitis; Rubber; Gloves; Latex; Vulcanization accelerator

Introduction

Hand eczema and breaking of the skin barrier condition are causative factors of occupational contact dermatitis. Workers with hands dermatitis use gloves to protect their skin from foreign substances, but hands in direct contact with rubber or polyethylene (PE) gloves may develop contact dermatitis due to latex, rubber, PE and additives. While latex allergy is a familiar concept to many, not all dermatosis associated with rubber gloves is caused by latex.

In the production of latex or rubber products, additives such as vulcanization accelerator or anti-aging agents are used. Additives are used in many kinds of products, and these often cause dermatoses, allergic reactions and other diseases. Vulcanization accelerators are known as allergens of contact dermatitis (allergic or irritant); included in this group are thiuram, dithiocarbamate and mercapto. Because vulcanization accelerators are used in various products, these additives might cause allergic sensitization. We show three cases of occupational dermatitis caused by vulcanization accelerator in rubber gloves.

Case Report

Case 1

A 24-year-old female patient with atopic dermatitis developed prurigo type dermatitis and erythema on her arms and hands. As a nurse in a neonatal intensive care unit, she used synthetic rubber or plastic gloves with high frequency. She did not use latex gloves because of concerns about latex allergy. Laboratory data showed eosinophil 3.5%, non-specific IgE 46 IU/mL, specific IgE against latex 0.1>UA/mL. Patch testing found positive results for nitrile gloves, thiuram mix and dithiocarbamate mix. Her nitrile gloves included thiurum strain vulcanization accelerator.

Case 2

A 29-year-old male worker in research and development, who worked with rubber gloves for 8 h per day, suddenly developed dermatitis on his hands. His laboratory data showed non-specific IgE RIST 15700 IU/mL and specific IgE against latex 0.1>UA/mL. Patch testing showed positive reactions for his gloves and thiurum mix. One ingredient of his gloves was thiuram strain vulcanization accelerator.

Case 3

A 36-year-old male metal-processing worker, who works with rubber and leather gloves, developed chronic dermatitis on his arms, and his dermatitis was not improved by steroid ointment. Patch testing showed positive reactions to his rubber gloves, thiuram mix and dithiocarbamate mix. Thiuram and dithiocarbamate were used as additives in his rubber gloves.

Discussion

Dermatoses caused by rubber products are developed not only by latex but also by rubber additives. The allergens of our three patients were not latex; rather, their dermatitis was caused by vulcanization accelerators. Physicians need to consider allergens besides latex when they see patients with hands dermatitis.

The prevalence of allergies to rubber additives and latex proteins has increased since the 1980s, as wearing rubber gloves as a routine preventive measure against infectious disease such as AIDS and influenza virus has become the norm. The frequencies of using personal protective equipment (PPE) and allergic contact dermatitis have increased [1]. Additives are used in many kinds of products, and these often cause dermatoses, allergic reactions and other diseases. Previously, we reported a case of contact urticaria and dermatitis due to an additive in working gloves and clothes [2-4].

There are many statistical data related with rubber, latex and additives; for instance, the frequency of latex allergy is 1-6.5% in the general population [5-9], 3-17% in health care workers [10-18] and

11% in latex glove-plant workers ([19-21], respectively. Taylor [22] reported that latex allergy in the general population is 1-2%.

The rates of type IV allergy caused by latex and rubber additives are 16.7 and 14.6% [23]. In the United States, Canada, Australia and Europe, 5% to 10% of the populations have allergies against rubber additives [24,25].

These results might depend on ethnic background, gender, occupation, age and other factors. Contact dermatitis due to additives may also be a result of increased used of additives. Across the world, the number of products using additives may actually exceed those using latex, and additives such as thiuram, mercapto and carba mix are part of various products used in the workplace and encountered in people's daily lives-including medicines, foods, and pesticides [1]. This frequent exposure to additives might cause sensitization.

The additives used in the manufacturing process of synthetic rubber gloves are important from a practical, economic and political standpoint [1]. These additives are often responsible for contact dermatitis due to rubber products [26]. Knudsen [27] described that the main rubber additives causing delayed hypersensitivity reactions are thiurams, carbamates and mercapto mixes. Exposure to 2-mercaptobenzothiazole and zinc dialkyldithiocarbamates occurs through clothing such as shoes, latex medical devices and nitrile gloves [28]. Additives cause dermatitis not only by direct contact but also through the clothing layer.

The frequencies of carbamates and thiurams are 3.4% and 1.75% [29]. The frequencies of positive patch test reactions for antioxidants (including IPPD, 8.6%), vulcanization accelerators and other rubber components are 16.6%, 10.6% and 11.4%, respectively [30]. The prevalence of allergy to carba mix is 2.29 % [31]. It is interesting that the frequency of positive patch test reactions differed by race in a group of 19,475 patients comprising 1,360 (7.1%) blacks and 17,803 (92.9%) whites. The positive rates of black and white subjects were 1.8% and 2.7% for mercaptobenzothiazole, 4.3% and 6.2% for thiuram, and with statistical significance, 0.8% and 1.9% for mercapto mix ($P<0.001$) [32]. Miri [23] reported on gender differences in type I latex allergy, with female gender being identified as a risk factor ($p=0.009$). Further study is needed to understand more about the exact reasons for the different susceptibilities for different genders and races. Worldwide comparisons with the same indicators would be important statistics to gather in this regard.

Hand eczema and breaking of the skin barrier condition are causative factors of occupational contact dermatitis [33]. Workers with hands dermatitis use gloves to protect their skin from foreign substances, but hands in direct contact with rubber or polyethylene (PE) gloves may develop contact dermatitis due to latex, rubber, PE and additives. It is necessary, if possible, to decrease the use and quantities of additives to reduce the incidence of dermatoses caused by additives. Preventative measures must not be left up to the employee alone; governmental and business strategies are essential for addressing occupational dermatoses. For instance, in Denmark, a carbamate (dibutyldithiocarbamate) with less potential to cause sensitization has been used to replace other allergens [34]. Individuals' ability to work and quality of life are reduced by hand eczema [33], and outbreaks of hand eczema could lead to increasing medical costs. We concluded that it is also important for patients with allergy to be able to identify the allergy accurately so as to avoid allergens and manage the risks of hand eczema.

Conflict of Interest

None.

References

1. Oliveira HR, Alchorne Ade O (2011) Fundamentals of the knowledge about chemical additives present in rubber gloves. An Bras Dermatol 86: 911-916.
2. Sugiura K, Sugiura M, Hayakawa R, Shamoto M, Sasaki K (2002) A case of contact urticaria syndrome due to di (2-ethylhexyl) phthalate (DOP) in work clothes. Contact Derm 46: 13-16.
3. Sugiura K, Sugiura M, Shiraki R, Hayakawa R, Shamoto M (2002) Contact urticaria due to polyethylene gloves. Contact Derm 46: 262-266.
4. Sugiura K, Sugiura M, Hayakawa R, Sasaki K (2005) N,N-dimethyl-n-dodecylamine caused contact dermatitis. Contact Derm 53: 353-354.
5. Meeropol E (1996) Latex allergy update: clinical practice and unresolved issues. J Wound Ostomy Continence Nurs 23: 193-196.
6. Hammer AL, Paulson PR (1997) Latex allergy: implementation of an agency program. Gastroenterol Nurs 20: 156-161.
7. Brehler R, Kutting B (2001) Natural rubber latex allergy: a problem of interdisciplinary concern in medicine. Arch Intern Med 161: 1057-1064.
8. Brehler R, Theissen U, Mohr C, Luger T (1997) Latex-fruit syndrome: frequency of cross-reacting IgE antibodies. Allergy 52: 404-410.
9. Anonymous (1995) Study suggests latex allergy may affect 6% of population. Health Facil Manage 8: 9-11.
10. Safadi GS, Corey EC, Taylor JS, Wagner WO, Pien LC, et al. (1996) Latex hypersensitivity in emergency medical service providers. Ann Allergy Asthma Immunol 77: 39-42.
11. Walsh K (2016) EMS and the latex allergic patient.
12. Wickware P (2000) Latex allergy poses threat to patients, practitioners. Dermatol Times 21: 16.
13. Liss GM, Sussman GL, Deal K, Brown S, Cividino M, et al. (1997) Latex allergy: epidemiological study of 1351 hospital workers. Occup Environ Med 54: 335-342.
14. Weesner BW Jr (1997) Latex allergies and adverse reactions: a review of the literature. J Tenn Dent Assoc 77: 21-26.
15. Thompson G (1997) Ways of avoiding latex allergy. Community Nurse 3: 33-34.
16. Bode CP, Fullers U, Roseler S, Wawer A, Bachert C, et al. (1996) Risk factors for latex hypersensitivity in childhood. Pediatr Allergy Immunol 7: 157-163.
17. Ylitalo L, Turjanmaa K, Palosuo T, Reunala T (1997) Natural rubber latex allergy in children who had not undergone surgery and children who had undergone multiple operations. J Allergy Clin Immunol 100: 606-612.
18. Theissen U, Theissen JL, Mertes N, Brehler R (1997) IgE-mediated hypersensitivity to latex in childhood. Allergy 52: 665-669.
19. Freeman GL (1997) Cooccurrence of latex and fruit allergies. Allergy Asthma Proc 18: 85-88.
20. Reddy S (1998) Latex allergy. Am Fam Physician 57: 93-100.
21. Zuskin E, Mustajbegovic J, Kanceljak B, Schachter EN, Macan J, et al. (1998) Respiratory function and immunological status in workers employed in a latex glove manufacturing plant. Am J Ind Med 33: 175-181.
22. Taylor JS, Erkek E (2004) Latex allergy: diagnosis and management. Dermatol Ther 17: 289-301.
23. Miri S, Pourpak Z, Zarinara A, Heidarzade M, Kazemnejad A, et al. (2007) Prevalence of type I allergy to natural rubber latex and type IV allergy to latex and rubber additives in operating room staff with glove-related symptoms. Allergy Asthma Proc 28: 557-563.
24. Kadsyn DL, McCarter K, Achen F, Belsito DV (2003) Quality of life in patients with allergic contact dermatitis. J Am Acad Dermatol 49: 1037-1048.

25. Hintzenstern JV, Heese A, Koch HU, Peters KP, Hornstein OP (1991) Frequency spetrum and accupational relevance of type IV allergies to rubber chemicals. Contact Dermatitis 24: 244-252.
26. Bergendorff O, Persson C, Lüdtke A, Hansson C (2007) Chemical changes in rubber allergens during vulcanization. Contact Dermatitis. 57: 152-157.
27. Knudsen BB, Larsen E, Egsgaard H, Menne T (1993) Release of thiurams and carbamates from rubber gloves. Contact Derm 28: 63-69.
28. Depree GJ, Bledsoe TA, Siegel PD (2005) Survey of sulfur-containing rubber accelerator levels in latex and nitrile exam gloves. Contact Dermatitis 53: 107-113.
29. Buttazzo S, Prodi A, Fortina AB, Corradin MT, Filon FL (2016) Sensitization to Rubber Accelerators in Northeastern Italy: The Triveneto Patch Test Database. Dermatitis 27: 222-226.
30. Rubisz-Brzezińska J, Bogdanowski T, Brzezińska-Wcisło L, Mozdzanowska K, Bajcar S (1990) Epidemiology of contact hypersensitivity to rubber components in manufacturers of automobile tires at the Stomil plant. Przegl Dermatol 77: 171-176.
31. Warburton KL, Bauer A, Chowdhury MM, Cooper S, Kręcisz B, et al. (2015) ESSCA results with the baseline series, 2009-2012: rubber allergens. Contact Dermatitis. 73: 305-312.
32. Deleo VA, Alexis A, Warshaw EM, Sasseville D, Maibach HI, et al. (2016) The Association of Race/Ethnicity and Patch Test Results: North American Contact Dermatitis Group, 1998-2006. Dermatitis 27: 288-292.
33. Weisshaar E (2016) Saving the Barrier by Prevention. Curr Probl Dermatol 49: 152-158.
34. Ingber A, Halevy S, Trottner A, Woltfriends S (1995) Mercapo-mix. Contact Derm 32: 255.