

Latex Hypersensitivity: A Closer Look at Considerations for Dentistry

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ABSTRACT

Over the past several decades, latex hypersensitivity has become an increasingly common phenomenon in the dental setting. Exposure to latex via direct skin contact or inhalation of airborne allergens from powdered gloves poses the risk of sensitizing both clinicians and their patients. Adverse reactions to latex range from mild irritant contact dermatitis to potentially life-threatening hypersensitivity. The prevalence of these reactions is higher among medical and dental practitioners, those with prior allergies, patients with a history of multiple surgeries and those with spina bifida. The risk of developing latex hypersensitivity increases with prolonged and repeated exposure. The incidence of latex allergy may be reduced through such simple measures as using latex alternatives and powder-free, low-protein gloves. For patients with confirmed latex allergy or those at risk of hypersensitivity, it is critical for dental personnel to be familiar with the range of possibilities for latex exposure and to employ appropriate preventive procedures.

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Latex hypersensitivity in dental patients and practitioners has significantly increased since the introduction of universal precautions for infection control over 20 years ago.¹ Repeated exposure to latex allergens in dental clinics is known to elicit adverse immune responses that can decrease quality of life, impede practitioners' ability to work in dentistry and limit patient access to dental care. Such exposure can even be life threatening to those at risk. In this paper, we describe signs and symptoms of latex reactions, identify sources of latex and associated allergens, discuss populations at risk for latex hypersensitivity and outline prevention and management protocols.

Latex Hypersensitivity

Natural rubber latex, which is an extract from the sap of *Hevea brasiliensis* trees, contains 256 proteins,² including 11 potential allergens.³ It is processed with as many as 200 chemicals and additives⁴ and made into over 40,000 dental, medical and consumer products.^{1,5} Exposure to latex allergens occurs via mucous membranes, the vascular system, inhalation and direct skin contact.^{1,5-8} The high vascularity and thin epithelium of mucous membranes contribute to increased risk of sensitization on direct contact of the oral mucosa with latex products.

Adverse reactions to latex include non-allergic contact dermatitis, delayed type IV

Box 1 Risk factors for latex hypersensitivity

- Health care professional^{1-5, 8-13}
- Family history of atopy^{1,3,6}
- History of irritant or allergic eczema^{1,3,5,7,8}
- Hay fever^{3,8}
- Spina bifida^{1,3,5-8}
- Spinal cord injury⁶
- Surgery before 1 year of age⁶
- History of multiple surgeries^{1,3,4,6,8}
- Congenital urogenital abnormality^{1,3,5,6}
- Intestinal malformation⁶
- Female gender^{2,4,8,14}
- Latex–fruit syndrome (allergy to avocado,^{1,3-8} banana,^{1,3-8} chestnut,^{1,3-8} kiwi,^{1,3-8} pineapple,¹ peach,¹ apricot,¹ cherry,¹ melon,¹ fig,¹ grape,¹ papaya,^{1,4} passion fruit,¹ potato,^{1,3,6,8} tomato,^{1,3,6,8} celery¹)

hypersensitivity and immediate type I hypersensitivity; most reactions are irritant contact dermatitis and type IV hypersensitivity.^{4,5,9} Irritant contact dermatitis is an immediate response to chemicals and additives in latex products, presenting as skin erythema, chapping and the formation of vesicles in areas of direct contact.^{1,4,8} Type IV hypersensitivity, also a skin or mucous membrane contact reaction, occurs 24–96 hours following exposure to chemicals in latex products and may or may not expand beyond the area of direct contact.^{4,8} Symptoms include erythema, pruritis, eczema, weeping, papules and vesicles. This hypersensitivity is diagnosed by patch testing.^{3,5,7,8} Although less prevalent, type I hypersensitivity is the most serious response. Immunoglobulin E (IgE) mediated type I responses to latex proteins result in adverse reactions within minutes to hours of exposure ranging from mild irritation to loss of life.^{7,8} Symptoms include pruritis, erythema, edema, rhinoconjunctivitis, urticaria, dyspnea, palpitations, dizziness, bronchospasm, vasodilation, gastrointestinal cramping, vomiting, hypotension and even death.^{5,6,8}

Populations at Risk

A number of factors are associated with increased risk of latex allergy (**Box 1**). People with a family or personal history of allergy (atopy) and those exposed to latex through occupational or surgical means are at heightened risk of latex hypersensitivity. The “latex–fruit syndrome” is a well-documented phenomenon involving IgE antibodies in fruit-allergic patients that cross-react

with latex proteins, culminating in allergic responses to latex.^{3,6,7,9} Patients with spina bifida are considered at high risk, because of their repeated latex exposure during immune system development, with some authors citing latex allergy in as many as 18%–73% of these patients.¹ Spinal cord injuries, congenital urogenital abnormalities and exposure to multiple surgeries are additional risk factors.^{2,3,6,7} Regarding clinicians, studies examining the incidence and prevalence of latex allergy in dental and medical professionals have shown positive correlations between late hypersensitivity and gender (with women being at higher risk),^{2,4} atopy^{2,4,7,10} and years of exposure.^{4,11,12} Conversely, adoption of powder-free, low-protein latex gloves in a clinical setting has been associated with a drop over 5 years in overall prevalence of type I hypersensitivity.¹³

Considerations for Clinical Practice

To manage those at risk appropriately, clinicians must be aware of the potential for exposure to latex in the dental office, prevention strategies to minimize exposure and appropriate management of adverse reactions.

Exposure to Latex

Sources of latex in dental clinics are abundant and not always obvious (**Box 2**). Vascular exposure occurs through intravenous delivery with latex syringes and tubing or medications stored in vials with latex diaphragms.⁵ Inhalation is primarily mediated through aerosolized cornstarch from powdered gloves, which binds to latex allergens.^{6,8} Anesthetic and oxygen masks containing latex constitute additional allergen sources and should be considered when preparing resuscitation carts for anaphylactic emergencies.^{1,3,6,8} Multiple glove changes, sweating hands and oil-based hand lotions (which cause gloves to deteriorate and solubilize latex proteins) increase risk of allergy on cutaneous exposure, while broken skin provides potential for hematogenous allergen exposure.^{1,6,8}

There is some controversy regarding whether anesthesia carpules and gutta-percha constitute a risk for patients with known latex hypersensitivity. Although local anesthesia carpules with latex diaphragms and plungers have been cited as sources of latex exposure,^{1,3,6} Shojaei and Haas⁵ propose that the risk of latex reactions to these carpules is minimal. Recognizing several medical case reports demonstrating latex-specific hypersensitivity to syringes and storage vials, these authors point to a lack of case reports proving latex reactions to dental local anesthetics. However, lack of case evidence provides no assurance that hypersensitivity risk does not exist in the dental setting, nor does it prove that reactions have not occurred. Rather, it makes it difficult to connect this potential risk specifically to the dental context.

Box 2 Potentially latex-containing products in the dental clinic

- Gloves¹⁻¹⁴
- Rubber dams^{1,3,5-7,9}
- Amalgam carriers⁷
- Anesthetic carpules (diaphragm and plunger)^{1,3,5-7,14}
- Intravenous tubing and bags^{1,3}
- Syringes (rubber stoppers covered with silicone)^{1,3,6,7,14}
- Bulbs on medicine droppers^{1,3,7}
- Bite blocks^{1,3,5-9}
- Oxygen masks^{1,3}
- Volatile anesthetic masks^{1,3,9}
- Operative masks with rubber ties^{1,5-7}
- Suction tips and suction tubing^{3,5,7}
- Air or water syringe tips and irrigation tubing^{7,9}
- Impression materials⁷
- Mixing bowls^{3,5,7}
- Orthodontic rubber bands and elastics^{1,5-7}
- Polishing discs^{3,7}
- Prophyl cups^{3,5-8}
- Bandages and tape^{1,3,7}
- Stethoscopes^{1,3,6}
- Blood pressure cuffs^{3,6}

Theoretical cross-reactivity

- Gutta-percha⁹

Another area of debate concerning risk of latex exposure is the theoretical cross-reactivity with gutta-percha. Although gutta-percha is almost structurally identical to latex and is derived from trees in the same botanical family, cross-reactivity has not been substantiated in the literature.⁹ While the potential exists, case reports indicate that it is not an automatic association.⁹ As a cautionary measure, consultation with an allergist and allergy testing for gutta-percha is indicated before endodontic treatment of latex-sensitive patients.⁹

Prevention

Minimizing latex exposure is the most effective strategy when treating latex-sensitive patients.^{1,3,6,9} Latex alternatives (vinyl, nitrile or silicone) and powder-free

gloves should be used in the dental clinic to prevent sensitization of patients and personnel. Patients with risk factors or confirmed latex hypersensitivity should be given early morning appointments to prevent exposure to aerosolized allergens.⁶ Barrier protection from contact with latex materials should be chosen for high-risk patients.^{6,9} Thorough patient history, including surgery, spina bifida, congenital abnormalities, atopy and latex hypersensitivity, should be taken during treatment planning appointments. At-risk patients should be identified and referred for latex allergy testing. Skin prick testing, radio-allergosorbent assays, enzyme-linked immunosorbent assays and in-use provocation testing can diagnose type I hypersensitivity.^{3,6,8} Although skin prick testing carries the risk of sensitizing patients to allergens, it offers the most reliable sensitivity and specificity of available diagnostic methods.^{1,2,6,8}

Management

Some authors suggest administering prophylactic antihistamines, such as diphenhydramine, or corticosteroids, such as prednisone, before dental treatment to those at known risk.^{6,9} However, when measures were taken to minimize latex exposure during dental treatment, Clarke¹⁴ reported that 81% of latex allergic patients did not suffer adverse reactions. Knowledge of signs and symptoms and management protocols for allergic reactions are essential for the treatment of patients who experience hypersensitivity regardless of precautionary measures.¹⁴ Latex allergen sources should be removed immediately on recognition of adverse reactions.

Contact dermatitis and type IV allergy may be managed with topical corticosteroids.¹⁵ Mild type I reactions without respiratory distress can be treated with topical steroids and antihistamines (50 mg diphenhydramine 4 times a day until swelling resolves).¹⁵ Severe type I hypersensitivity with respiratory distress, swelling of the tongue, larynx or pharynx and anaphylaxis requires assessment of ABCs (airway, breathing and circulation) and activation of emergency medical services.¹⁵ For anaphylaxis, latex-free resuscitation carts are used to administer high-flow oxygen and deliver 0.3–0.5 mL intramuscular or subcutaneous doses of 1:1000 epinephrine¹⁵ (0.1 mL/kg every 5 minutes for children).⁶ Vitals and ABCs should be continually monitored and cardiopulmonary resuscitation provided if necessary.¹⁵ Following stabilization, antihistamines, such as diphenhydramine and corticosteroids, should be prescribed.¹⁵

Concluding Remarks

Latex hypersensitivity is an all too common occurrence in the dental clinic. Latex proteins are responsible for type I hypersensitivity, while chemicals and additives including ammonia, accelerators, antioxidants and vulcanizing agents may cause type IV hypersensitivity and

non-allergic contact dermatitis.^{1,3,4,7} It is significant that many of these processing agents are used in the production of latex alternatives,^{3,8,13} thereby explaining similar type IV and non-allergic contact dermatitis to latex-free products. This raises the possibility of hypersensitivity shifting from type I to type IV reactions as latex alternatives increase in popularity. It is imperative that dental professionals identify high-risk populations, keep apprised of sources of allergens and cross-reactivity and employ appropriate preventive measures. Recognition of hypersensitivity and prompt management of reactions is paramount for the safety of dental patients and personnel. ✦

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