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Natural rubber latex allergy in children: Total latex avoidance in early years can significantly reduce the incidences of Type-I and Type-IV allergic reactions in later life.

This article shows that there is an increasing amount of evidence indicating that exposure to latex in a child's early years notably increases the risk of developing a potentially life threatening latex allergy, at worse, and at best, asthma and/or eczema later in life. With the availability of so many alternatives to latex, isn't it time to completely avoid latex exposure in children's hospitals and women's maternity wards?

Who is at risk of developing a latex allergy?

Children who undergo multiple surgical procedures are especially at risk from developing a latex allergy. Children with spina bifida and other urogenital disorders requiring multiple operations are one of the most important risk group to a natural rubber latex allergy.[2] However, it is not just children who may face long term health conditions due to being over exposed to latex J.Worth states that babies born in delivery rooms of hospitals are exposed to latex through skin and mucous membranes.[1] This includes babies born naturally if the hospital has not changed to nitrile examination gloves, and even more than ever, babies that are born by caesarean section, as it is still standard practice to wear latex surgical gloves in operating theatres.

In England, the caesarean rate has increased by 0.7 per cent to 26.2 per cent (166,081) in 2013–14. There has been a rise in the number of elective caesareans (2.5 per cent) while emergency caesarean rates are down 1.8 per cent. This continues the trend of increasing elective caesarean rates but a drop in the emergency caesarean rates[4]. Therefore, over a quarter of the babies born in England are born by C-section and the first material to touch their skin will be latex, unless the Surgeon has opted for synthetic gloves.

Children born by c-sections with use of latex gloves are at risk of latex sensitisation, and part of the sharp increase of childhood asthma, eczema and anaphylaxis in the past 30–40 years may be linked to this latex sensitisation. **Latex sensitisation is irreversible and sensitised individuals will need to avoid latex all together.**[1]

Why are children at risk?

Over exposure leads to sensitisation, which then can lead to a build-up of IgE antibodies to latex, and as the level of IgE increases so do the allergic reactions. Arguably, that the more a child is exposed to latex in childhood, the greater the sensitisation.

Epidemiological thinking today is that early life exposure to allergens is more likely to lead to sensitisation than at any other time in life.[1]

There is currently no cure for latex allergies, hence the value of creating a latex-free environment. This method is likely to avoid not only clinical manifestations but also sensitisation for both patients and caregivers.[5]

Asthma and eczema are known as clinical reactions to latex allergy, patients with latex allergies are more likely to suffer from atopic eczema, allergic rhinitis, hay fever, or asthma with the possibility that other allergic diseases may be traced to the same sources.[1][3]

The latex that is used industrially is derived almost exclusively from the rubber tree, Hevea brasiliensis, which belongs to the family Euphorbiaceae.[3] Many plants in the Euphorbiaceae family share common factors that are highly allergenic to some people. Two known cross-reactions occur with a latex allergy: food cross reactions and plant and pollen cross reactions. Hevea Brasiliensis is related to many fruit trees. The Brehler study of 1997 identified fruit-specific IgE antibodies in latex-sensitive children, confirmed by RAST. Specifically, papaya, mango, avocado, banana, chestnut, passion-fruit, fig, melon, kiwi, pineapple, peach, and tomato.[1] Children who are allergic to latex proteins may thus also develop fruit allergies.

What is a latex allergy?

There is more than one type of allergy in connection with either latex proteins in natural rubber latex or accelerators used in certain production processes. Allergic contact dermatitis is a Type-IV delayed immunological reaction. This type of reaction is not life threatening although it is extremely itchy and uncomfortable. It is characterised by blistering as well as redness and itching. It progresses to dryness and scaling as it heals. This can be qualified as a sensitisation to residual chemicals (e.g. accelerators) used during the production of conventional rubber products.

Another more serious type of allergy is a Type-I allergy. Type-I allergy causes immediate allergic reactions soon after contact is made with latex. This is due to an allergic reaction with the protein content of natural rubber. Unlike the Type-IV reaction, it is not delayed and can occur within minutes of contact. Latex allergy is an IgE-mediated hypersensitivity to NRL (natural rubber latex), presenting a wide range of clinical symptoms such as angioedema, swelling, cough, asthma, and anaphylactic reactions[3].

Allergies in connection with latex products

	Immediate Allergic Reaction Type-I hypersensitivity	**Allergic Contact Dermatitis** Type-IV hypersensitivity	**Contact Dermatitis** Irritation
Onset	Minutes to hours	Hours to days	Hours to days
Symptoms	Itching, swelling of tongue and throat, inflammation of nose and eyes, difficulty in breathing, drop in blood pressure	Eczema like changes to the skin	Redness, itching, dryness, cracking, scaling and vesicle formation
Skin Changes	Can involve all the skin layers	Can spread from initial affected area	Localised to area of contact
Reaction Involves	B lymphocytes and Mast Cells	T lymphocytes	
Life Threatening	Yes	No	No
Cause	Antigenic Latex proteins	Chemical accelerators from conventional crosslinking processes	Residual soaps beneath the glove, or oil based (paraffinic) skin care products

How does a latex allergy occur?

Latex is composed of spherical polyisoprene droplets coated with a layer of water-soluble proteins. Natural rubber (cis -1,4-polyisoprene) is a processed plant product of the rubber tree, Hevea brasiliensis . It contains variable amounts of water-soluble proteins that can be recognized as allergens by the human immune system[3]. Despite this recognition, latex allergy remains the second most common cause of intra-operative anaphylaxis.

Latex allergies are also clearly linked with food allergies. 'The latex-fruit syndrome' was first described in 1994[7], and the mechanisms for the cross reactivity are becoming increasingly clear. Natural rubber latex (NRL) is mainly obtained from the Hevea brasiliensis tree. Hevein, a protein found in NRL, is an important immunoglobulin E (IgE) binding allergen in latex allergic patients[8]. Hevein is one of a group of plant proteins known as chitinases which are plant defence proteins that degrade chitin, a major component of fungal cell walls[9]. These proteins are preserved across many plant species.

As a consequence, there is sequence homology of between 70–80 % in the N-terminal chitin binding domain of NRL hevein and class 1 chitinases or endochitinase of avocado, banana and chestnut. It is the N-terminal domain that is thought to be responsible for binding to IgE, resulting in clinical sensitisation and hypersensitivity reactions[10].

How can this be prevented?

Prevention of latex allergies in a health care setting can be easily managed. Most medical devices are now latex-free due to the prevalence of latex allergies. However, healthcare professionals that wear surgical gloves and the choices they make are not as up to date. It has always been the surgeon and/or scrub staff's choice to decide whether to wear latex or latex free gloves, irrespective of the potential impact on their patients, unless the patient was known to have a latex allergy.

Primarily, it is advised to avoid any sensitisation to latex in the first instance. To do this, there should be an environment that is completely free of products containing latex. This is especially vital to ensure from birth and from the first intervention for children with spina bifida and those at risk of being multi-operated. Studies have shown a correlation between the number of surgical procedures, especially in the first year, and the degree of sensitisation measured by the specific IgE level[5].

The problem of sensitisation and allergic accidents to latex in pediatric operating wards has been a key topic for several years. The incidence of sensitised persons and severe anaphylactic reactions in the latex-related surgical suite has increased dramatically since the 1980s. Despite a recent decrease of such incidents through secondary prevention measures, exposure to latex remains a public health problem that affects both patients and caregivers.[5]

A transition to an environment free of latex products, whether in traditional hospital services or in the operating room, would not only avoid a risk of sensitisation and allergic accidents but is also a long-term financial gain.[5] It also avoids the need to wait 90 minutes between surgeries if the allergic child cannot go first on the list, which is normally required to reduce the likelihood of latex allergens in the atmosphere.

Because sensitisation usually occurs by wound or mucosal contact with latex during surgery, the most effective strategy to decrease the incidences of latex sensitisation is complete avoidance.[6] In 2002, Pediatric hospital in Bron, France, went entirely latex-free and stated in 2009 that since going latex-free there have been no reported incidents of latex reactions in any of their 25,000 anaesthetised paediatric patients. They also state that the cost of going latex-free was counter balanced by the decrease in allergen testing for specific IgE levels, longer stays and worker's compensation, all of which are no longer needed.[6]

How can Sempermed® help you minimize these risks?

In recent years, both the latex protein content and the chemical residues have been reduced significantly through new engineering methods in glove production. Moreover, new vulcanisation accelerators have been developed that are significantly more tolerable and do not have any residues that are easily released.

The role of accelerators

Vulcanisation is the most important step in the rubber manufacturing process, and neither natural nor synthetic latex would be elastic without it. Therefore, the long rubber molecule chains lying next to each other are cross-linked under the influence of heat and with the help of sulphur. The number of sulphur bridges (crosslinking density) depends on the sulphur quantity and vulcanisation time, and it is decisive for a high degree of elasticity and dimensional stability of the glove material.

Accelerators function as catalysts for this cross-linking process: They increase the speed and efficiency of the formation of the net structure, and they improve the elasticity, resistance, and durability of the gloves. Some new accelerators used today are more effective and safe, although there are cross-linking processes available which do not need the conventional accelerators. Many traditional vulcanisation accelerators of the thiurame, carbamate and thiazol group have been identified as potent contact sensitisers. Some of them have also been classified as harmful to health and the environment, or as producers of carcinogenic nitrosamines (nitrogen compounds that cause cancer). The identification of these risks has resulted in thiurames, for example, no longer being used in quality gloves, and new accelerators being developed that are significantly safer.

Sempermed® offers a range of latex-free surgical gloves made from synthetic polyisoprene with natural latex alike properties, such as the Sempermed® Syntegra IR and Syntegra UV.

The synthetic Sempermed range is not only an excellent alternative for people with allergies. These gloves are free from latex proteins and powder, and are either vulcanised with an innovative accelerator system, like the Sempermed® Syntegra IR, or completly accelerator-free, like the Sempermed® Syntegra UV.

Maximally skin friendly made in Austria
latex-free • skin-friendly accelerators • synthetic polyisoprene

The latex-free Sempermed® Syntegra IR is made of synthetic polyisoprene (IR) and an excellent alternative not only for people with allergies: Free from latex proteins and powder, it is vulcanised with an innovative accelerator system that is extremely low in allergens.

The synergy between the two multifunctional accelerators DIXP and ZDNC (diisopropyl xanthogen polysulphide and zinc diisononyldithiocarbamate) brings with it a whole range of benefits:

- DIXP reacts very quickly and its reaction products volatilize completely during the vulcanisation process.
- ZDNC is a virtually non-allergenic dithiocarbamate accelerator. Hardly any other accelerator on the market today has as much safety data as DIXP and ZDNC.

Consequently, the type-IV allergy potential of the Sempermed® Syntegra IR is extremely low. At the same time it offers all the material properties that natural latex gloves also have.

Benefits at a glance:
✓ SKIN-FRIENDLY FORMULATION –
latex-free and innovative accelerators
✓ LATEX ALIKE COMFORT
✓ EASY DONNING

A new Dimension of skin-friendliness and wearing comfort
latex-free • accelerators-free • synthetic polyisoprene

The Sempermed® Syntegra UV composes a complety new dimension of skin-friendliness and wearing comfort.

After years of research, the Sempermed® R&D team has succeeded in using photochemical processes – induced by UV light – to interlink the glove film. This new production process developed at the Austrian facility allows the new Sempermed® Syntegra UV to be manufactured without accelerators. Thanks to polyisoprene, a material similar to natural latex, it also offers the popular comfort of latex.

Benefits at a glance:
✓ SKIN-FRIENDLY PROTECTION AGAINST ALLERGIC REACTIONS –
latex-free and accelerator-free
✓ LATEX ALIKE COMFORT
✓ GOOD TACTILE SENSES

This unique accelerator free glove offers even more protection against allergic reactions, protecting both the patient and the wearer.

The Sempermed® Syntegra UV has been awarded the European Innovation Award in 2016.

Green light for safety
latex-free • skin-friendly accelerators •
synthetic polyisoprene

The Sempermed® synthetic underglove Syntegra Green gives the green light for increased safety in the OR room. With its smooth surface structure and optimised fit, it is the ideal solution when combined with the Sempermed® Syntegra IR and the Sempermed® Syntegra UV for double-donning, completely latex-free.

- The green colour enables any liquid seeping in between the gloves to be detected at an early stage, and the puncture will appear visually.
- The special synthetic polyisoprene formulation imitates the structural properties of natural latex, without incorporating any of its disadvantages: high elasticity and suppleness with low tension, excellent fit and hand mobility, superior tactility, and secure grip.

The Sempermed® Syntegra Green uses the same innovative accelerator system as the Sempermed® Syntegra IR and offers the same high standards in terms of skin-friendliness, comfort, and safety.

Benefits at a glance:
✓ GREEN COLOR –
for easy and fast identification of glove perforation
✓ SKIN-FRIENDLY FORMULATION –
latex-free and innovative accelerators
✓ LATEX ALIKE COMFORT AND EASY DONNING

Conclusion

Ideally, moving forward, all maternity and children's units should be a latex-free zone, from examination gloves to the surgical gloves and everything in between. The risk of over exposure to latex would be greatly reduced by embracing synthetic polyisoprene and nitrile as glove materials in these departments. This could help prevent many children from developing not just a latex sensitisation but also atopic eczema, allergic rhinitis, hay fever, or asthma could prevent possible fatal anaphylactic reactions later in life.

Overall, a greater range and quality of medical gloves is available to the user today, offering a differentiated choice and better tolerability even for modern clinical demands and surgical techniques.

To avoid overexposure to latex in children, these gloves should be used when performing any type of surgical procedure on an infant or child, or for caesarean sections.

For more information on the products available please contact Sempermed® and one of our regional account managers will be happy to further discuss and demonstrate these products for you.

About the author

Maree Diamond BSc (Hons) DipHE ODP has a degree in Biomedical Science, Microbiology and Molecular biology. She is a qualified operating department practitioner and is part of the Sempermed team in the United Kingdom.

Author:
Maree Diamond BSc (Hons) DipHE ODP

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Publisher and Editor: Semperit Technische Produkte Gesellschaft m. b. H., Division Sempermed, Modecenterstrasse 22, A-1030 Vienna, Tel. +43 1 79 777-0, Fax: +43 1 79 777-630, E-Mail: sempermed@semperitgroup.com, www.sempermed.com
FN 36912h, Commercial Court Vienna

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