

## Prevention of Glove-related Latex Allergy in Healthcare Workers

Natural Rubber Latex (NRL) can cause asthma and dermatitis. NRL is used in medical gloves but is also found in many other medical products, such as rubber dam equipment, elasticised bandages, dressings etc.



Allergy to certain latex proteins emerged as an occupational disease in the 1980s and continues to be an important occupational health problem as NRL products are used increasingly worldwide, particularly in healthcare. The use of gloves is an important element of infection prevention and control in healthcare.

### Effects of Latex Allergy

Symptoms of the immediate type of latex allergy range from rash, itchy or runny eyes or nose, sneezing, and coughing to chest tightness, shortness of breath and anaphylactic shock. The symptoms experienced depend in part on the route of exposure, which can be by direct contact with skin or mucosa, or by inhalation (see table 1 for types of reactions to gloves).

Table 1: Reactions to gloves are generally as follows (Authority, 2001 Page 65):

Type	Signs/symptoms	Cause	Comment
Irritant Contact Dermatitis	Scaling, drying, cracking of skin	Irritation by gloves, powder, soaps/detergent, incomplete hand drying	Most common reaction to glove usage
Allergic contact Dermatitis <i>Type IV delayed hypersensitivity, allergic contact sensitivity</i>	Blistering, itching, crusting	Processing chemicals*	Appearance like that of poison ivy rash
Immediate hypersensitivity, <i>IgE/histamine-mediated allergy, Type I hypersensitivity</i>	Local : hives Systemic: generalised urticaria, rhinitis, wheezing, asthma, swelling of mouth, shortness of breath, can lead to anaphylactic shock	Latex proteins – direct contact or inhalation	Anaphylactic shock is very rare and is treated with adrenaline

*(Italics indicates another name by which reaction may be known)*

\*Processing chemical are chemicals used in the manufacture of NRL gloves.

## The Law

The most relevant sections of Irish health and safety legislation dealing with occupational exposures to NRL products are:

- the Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001 (S.I. No. 619 of 2001), particularly Regulations 4 – 6,
- the Safety, Health and Welfare at Work Act 2005 (S.I. No. 10 of 2005), particularly Parts 2 & 3 and Schedule 3,
- the Safety, Health and Welfare at Work (General Application) Regulations 2007 (S.I. No 299 of 2007), particularly chapter 3.

## Relevant European Standards

Irish and European Standard IS EN 455-3:2006 calls for:

- medical gloves containing NRL should be labelled on the packaging as such
- in order for gloves to be labelled “powder-free”, they must have a powder content of <2.0 mg/glove
- the product labelling for medical gloves containing NRL shall not include any term suggesting relative safety, such as low allergenicity, hypoallergenicity or low protein

Since 2008, IS EN ISO 15223-1:2012 (and its predecessor EN 980:2008) calls for all medical devices containing NRL in the device or packaging, to be labelled as such.

*NOTE: According to MEDDEV.2.5/9 rev.1 (Commission E., 2004), the determination of the leachable protein level cannot be used to define a level of exposure that could be deemed “safe” with a realistic margin of error. Lowering the leachable protein levels to as low as reasonably (ALARP) is indicated because the lower the bio-available allergenic protein level, the lower the risk for inducing sensitisation and eliciting reactions (hereafter referred to as ‘Lower-Protein gloves’).*

*According to (Yip E. et al., 1997)  $E.P_{RRIM} \leq 100\mu\text{g/g}$  glove have very low allergen contents (where  $E.P_{RRIM}$  is the extractable protein level using the modified Lowry assay and the colorimetric measurement as per rubber research institute of Malaysia (RRIM)).*

## Exposure mechanisms

Reports about the prevalence of latex allergy vary greatly, estimating that about 1% – 6% of the general population and about 8% – 12% of regularly exposed health care workers are sensitised to latex. Once sensitised, further exposure to even to low levels, may cause a reaction.

The proteins responsible for latex allergies have been shown to fasten to the powder (corn-starch, talc), that is added to gloves to facilitate donning and removal. This powder can serve as a carrier for the allergenic proteins in the gloves. Hence, when powdered gloves are worn, more latex proteins reach the skin. When powdered gloves are removed the powder particles become airborne and can be inhaled and come in contact with body membranes.

Powdered NRL gloves have higher latex allergen content than powder-free NRL gloves and there is good evidence that use of powdered NRL gloves is associated with a substantially higher prevalence and rate of latex sensitisation.

The producers of NRL gloves, responding in part to customer preference, have made substantial efforts to reduce the protein content of gloves. Data suggests that in 1996, powdered latex gloves contained up to 515 µg/g of latex protein per glove, whereas by 2003, powder-free latex examination gloves contained up to 35 µg/g of latex protein per glove, representing more than a 10-fold reduction (RCP, 2008 Page 5).

In addition, the modern NRL glove manufacturing processes, with in-line leaching, high temperatures and post washing procedures, have resulted in gloves with much lower allergenic potential (Palosuo et al., 2011, Page 240).

These changes in glove manufacturing technology, coupled with progress in measuring the specific allergenic potential of gloves and glove-user education programmes, have had it is claimed, an impact on the lower incidence rates of new Type I and Type IV allergic reactions, reported in recent times (Palosuo et al., 2011 Page 234).

## **Prevention / Protection**

In managing the risk of glove related latex allergies, the Principles of Prevention must be taken into account. This hierarchy of control measures applies and is contained in Schedule 3 of the Safety, Health and Welfare at Work Act 2005:

- 1) The avoidance of risks (e.g. use of NRL-free products)
- 2) The evaluation of unavoidable risks
  - a. Identification of at-risk workers (e.g. atopy, history of allergy)
  - b. Identification of workers with latex sensitisation / allergy (e.g. self-declaration, occupational health screening etc.)
- 3) The combating of risks at source (e.g. avoid exposure)
- 4) The adaptation of the workplace to the individual
- 5) The adaptation of the workplace to technical progress (e.g. latex safe)
- 6) Substitution, e.g. on-going substitution of NRL gloves with:
  - a. Gloves which are powder free, have lower protein and lower levels of accelerators (i.e. processing chemicals)
  - b. Synthetic equivalents
- 7) Prioritising collective protective measures (e.g. implementing, evaluating and reviewing NRL strategy) over individual protective measures
- 8) Development of adequate "Prevention policies":
  - a. Primary (i.e. proactive provision of information, such as procurement policy for the selection of gloves).
  - b. Secondary / Tertiary (e.g. occupational health follow-up of diagnosed workers)
- 9) Appropriate training and instructions.

### Glove selection criteria

One of the key prevention measures is the adoption of an appropriate procurement policy for the selection of gloves. In this regard the glove selection flow-chart shown in Appendix 1 is valuable.

The following should be considered when selecting gloves in the workplace (Executive, 2014),

- a) Decide whether or not protective gloves are required at all to perform the task (the law requires that other means to prevent exposure should be considered in preference to gloves). There may be reasons other than worker protection that require the use of gloves e.g. patient protection in healthcare. When deciding on glove selection, employers need to take account of all factors.
- b) If protective gloves are needed, they must be suitable. This means they provide adequate protection against the hazard and are suited to the wearer, the work and the environment in which they are used. To ensure suitability, consider the work (substances handled, other hazards, type and duration of contact), the wearer (comfort and fit) and the task (e.g. need for dexterity; sterility issues). This information is required to decide on the most suitable glove type, e.g., single-use or reusable, and the material they are manufactured from.
- c) If the employer's risk assessment finds NRL to be an appropriate glove type for protection against the hazard, then:
  - i. Single-use NRL gloves should be powder-free and lower-protein.
  - ii. Individuals with existing allergy to NRL proteins should take latex avoidance measures and should not use single use or reusable latex gloves. Employers may therefore need to provide gloves of an alternative material.
  - iii. Where the use of gloves may result in direct or indirect exposure to members of the public (e.g. single-use latex gloves used in patient care etc.), the employer must undertake an assessment of the risks of such exposure and adopt suitable control measures to ensure the health of others is protected.
  - iv. Where powder-free, lower-protein, single-use latex gloves are used in the workplace, the employer must, as part of the risk assessment, determine if health surveillance for occupational asthma should be in place (*Given that the risks of developing occupational asthma are considered to be low, where health surveillance is appropriate, a low level of health surveillance is likely to be sufficient*).
  - v. Employers must be able to demonstrate that they have carried out a risk assessment (as set out above) to select which (if any) type of gloves they should provide. They must also be able to demonstrate that they have an effective glove use policy in place that, for example, takes account of those

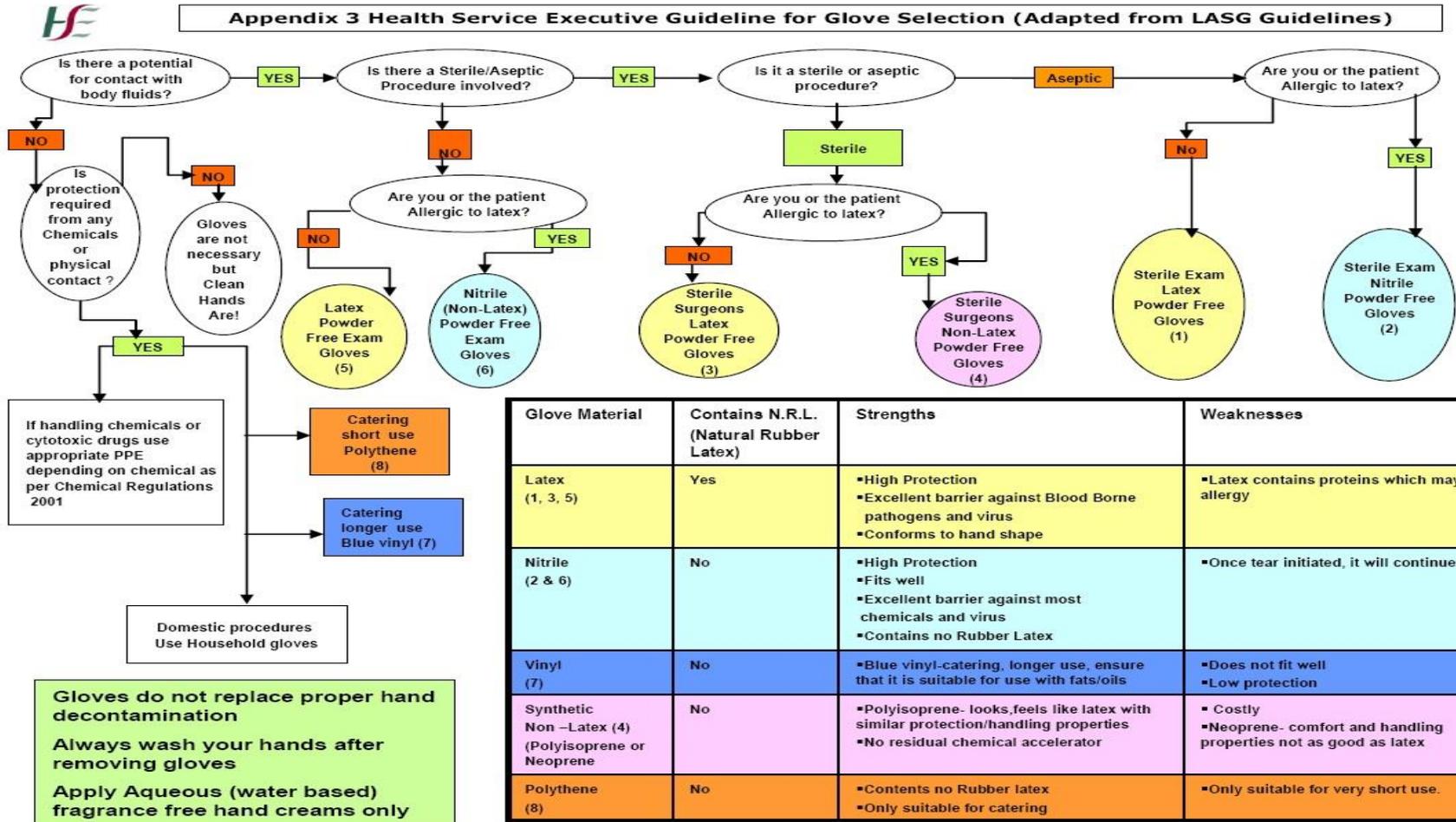
employees or others (such as members of the public), who may have a latex allergy.

- d) Whenever protective gloves are used (regardless of the material), employers shall provide information, instruction and training to employees on how to use the gloves to properly protect themselves. This shall include the provision of information on latex allergy, if this is appropriate.
- e) Whenever protective gloves are used (regardless of material), employers must consider the need for, and, if appropriate, implement suitable health surveillance for work-related dermatitis i.e. regular skin checks.

## References

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# APPENDIX I



Glove Material	Contains N.R.L. (Natural Rubber Latex)	Strengths	Weaknesses
Latex (1, 3, 5)	Yes	<ul style="list-style-type: none"> <li>High Protection</li> <li>Excellent barrier against Blood Borne pathogens and virus</li> <li>Conforms to hand shape</li> </ul>	<ul style="list-style-type: none"> <li>Latex contains proteins which may cause allergy</li> </ul>
Nitrile (2 & 6)	No	<ul style="list-style-type: none"> <li>High Protection</li> <li>Fits well</li> <li>Excellent barrier against most chemicals and virus</li> <li>Contains no Rubber Latex</li> </ul>	<ul style="list-style-type: none"> <li>Once tear initiated, it will continue to tear</li> </ul>
Vinyl (7)	No	<ul style="list-style-type: none"> <li>Blue vinyl-catering, longer use, ensure that it is suitable for use with fats/oils</li> </ul>	<ul style="list-style-type: none"> <li>Does not fit well</li> <li>Low protection</li> </ul>
Synthetic Non-Latex (4) (Polyisoprene or Neoprene)	No	<ul style="list-style-type: none"> <li>Polyisoprene- looks, feels like latex with similar protection/handling properties</li> <li>No residual chemical accelerator</li> </ul>	<ul style="list-style-type: none"> <li>Costly</li> <li>Neoprene- comfort and handling properties not as good as latex</li> </ul>
Polythene (8)	No	<ul style="list-style-type: none"> <li>Contents no Rubber latex</li> <li>Only suitable for catering</li> </ul>	<ul style="list-style-type: none"> <li>Only suitable for very short use.</li> </ul>