# The Future of Synthetics

*a report by*
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Natural rubber latex (NRL) surgical gloves offer excellent barrier properties and are the ultimate in fit, feel and comfort. The latex is produced naturally from the tropical tree *Hevea brasiliensis*. This tree was transplanted from its natural habitat in the Amazonian rain forest to countries in Asia where large plantations are harvested. The largest plantations and suppliers of NRL are now in India, Thailand, Sri Lanka and Malaysia.

The main component of NRL (excluding water) is rubber, which is predominantly the polymer cis-1,4-polyisoprene. This polymer contributes to the properties (elasticity, strength, fit, feel and comfort) of NRL gloves. In addition, NRL contains other components such as resinous substances, sugars and proteins. It is some water-soluble protein species that are now known to potentially cause a Type 1 allergic response in certain predisposed individuals.

Some individuals are sensitised to the proteins present in NRL; this particularly impacts on healthcare workers as they are unable to use gloves or other equipment manufactured from NRL. The introduction of regulatory standards and improved manufacturing techniques has helped reduce the level of NRL proteins in the final product, but this is of no help to those individuals who are already sensitised and must avoid contact with NRL proteins completely.

For these sensitised individuals, it has been necessary to identify suitable alternative materials to NRL and a number of synthetic materials have been used to manufacture surgical gloves. These include nitrile, polychloroprene (neoprene), block copolymers and polyurethanes. Polychloroprene and nitrile are both water-based latices and can be manufactured on equipment similar to that used for NRL gloves. Most polyurethanes and block copolymers are solvent-based and therefore manufacturing gloves from these materials requires significant investment in new equipment. Research is still continuing into suitable water-based versions of these materials.

Even though these alternative materials are available and remove the risk of latex protein allergy, their sales volumes remain relatively low. There are thought to be two main reasons for this slow uptake: one is cost, since synthetic materials have a consistently higher cost than NRL; the second reason is that the fit, feel and comfort of these gloves is generally inferior.

More recently, there have been further developments in the commercialisation of synthetic polyisoprene. This polymer is the synthetic equivalent of natural rubber – therefore the physical characteristics of the material are very similar.

The synthetic polymerisation of the isoprene monomer can lead to various forms of polyisoprene being generated. In order to replicate NRL, the formation of these units has to be restricted to predominantly cis-1,4-polyisoprene. NRL contains >98% cis-1,4-polyisoprene and the synthetic equivalent now being used to manufacture most polyisoprene gloves contains >90% cis-1,4-polyisoprene with a small amount of other forms being present. The physical properties of synthetic polyisoprene gloves are comparable to NRL, which is reflected in the equivalence of fit, feel and comfort. Now, there is a true synthetic equivalent to NRL gloves that removes concern about latex protein allergy. It will be interesting to see if there will be a greater demand for synthetic surgical gloves.

Regent Medical Limited is a global leader in high quality, technically advanced powder-free surgical gloves and skin antisepsis products. Best known for the Biogel® range of gloves and Hibi Antiseptics, the company was formerly part of the SSL group of companies. ■