Development of a Solvent System for Effective Leaching of Extractable Proteins in Dipped Product Surfaces

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Allergic conditions caused by natural rubber latex (NRL) proteins have become a vast problem in the natural rubber latex industry. Leaching is one of the protein removal methods which have been used in the industry. The objective of this study was developing a leaching solvent system to remove surface NRL proteins from dipped product surfaces using urea and sodium dodecyl sulphate (SDS). In this research NRL samples were prepared and leached using 4 different solvent systems namely distilled water, urea, SDS and a mixture of urea and SDS. At a time, one sample set (3 latex sheets to triplicate the results) was leached in previously mentioned solvent systems for a particular time and then washed with flowing water. Nine sample sets were used for the study. One sample set was kept without leaching. After leaching, Attenuated Total Reflectance Fourier Transform Infrared spectroscopy (ATR-FTIR) was used for qualitative determination of remaining surface protein content and modified Lowry method was used for quantitative determination of surface proteins. Antigenic proteins on sample surfaces were quantified using enzyme linked immunosorbent assay (ELISA) which is determined by reactions between specific NRL antibodies and NRL antigenic proteins. Without leaching, the average remaining extractable protein content was above the detection limit (> 200 μg/g). Therefore, water leached sample set was used as the control. When the urea concentration in leaching was increased, the removal efficiency of surface proteins was higher when a mixture of urea and SDS was used compared to when urea alone was used. This was observed in all the concentrations of urea: SDS ratios used. The maximum removal efficiency (74.36%) was observed for the leaching solvent mixture containing urea: SDS ratio 3:1. This could be due to the fact that both urea and SDS influence in deproteination and that increases the solubility of extractable proteins. In addition, ELISA suggested that after leaching, the antigenic protein content was below the detection limit for all the solvent systems used. However, since the removal of extractable protein content was maximized when mixture of urea and SDS was used it is expected that the antigenic protein content might also be further reduced compared to other solvents used.

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